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KØBENHAVN
I KOMMISSION HOS C. A. REITZEL
Trykt hos J. Jørgensen & Co. (Ivar Jantzen)
1916

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HYDROGRAPHIC INVESTIGATIONS

FROM THE DANISH SCHOOL SHIP »VIKING«

IN THE

SOUTHERN ATLANTIC AND PACIFIC

IN 1913—14

BY

TH. P. FUNDER

KØBENHAVN
I KOMMISSION HOS C. A. REITZEL
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1916

In May 1913, when on the point of starting a voyage with the school ship »Viking« as leader ot the theoretical school on board, I addressed myself to the Hydrographical Laboratory in Copenhagen to inquire if the Laboratory would be willing to provide me with hydrographical instruments for the purpose of surface investigations of the same kind as those I had carried out previously from steamers in the northern Atlantic. My request was met with great kindness, and I was asked not to restrict myself entirely to surface observations, but to extend the investigations to depths of 5—600 metres.

The conditions on board did not favour investigations on any large scale, and the time of which I could dispose for this kind of work was also very limited. At the Hydrographical Laboratory I had the opportunity to practise titration of sea-water, as it would be of importance that this kind of work should be carried out on board, owing to the proportionately long time that otherwise would pass before the material could be examined at home.

On board a room fitted up as a laboratory was placed at my disposal, and from the Hydrographical Laboratory of Copenhagen I was provided with the apparatus and the reagents necessary for the titration. Moreover I got a Martin Knudsen water bottle for use, when the ship was sailing as well as thermometers, bottles with patent lock for keeping for water till titration could take place, and for the collection of water samples for the determination of oxygen. The bottles were of a size of ca. 150 cm^3 with cut glass stoppers.

The filling of these bottles, the adding of reagents and keeping of bottles in large glasses containing water with the aim of titration at our Hydrographical Laboratory, were carried out as usual. Finally I had a 600 metres wire, which was fixed to a sounding machine set up astern.

As mentioned before the conditions on board were not always favourable, to this kind of investigations, but when the service on board made it possible and the weather was no hindrance, I had men at my disposal to use of the water bottle, and if I have succeeded in collecting material not quite devoid of importance, I owe my best thanks to Captain Poulsen for his warm interest in the investigations. I am also indebted to the surgeon, Mr. Halberg, for valuable help on several occasions.

After consultation with Dr. J. P. Jacobsen whose guidance was a valuable help to me in my investigations, collections were undertaken for oxygen determinations at two stations in the Atlantic and at one in the Pacific. The results of these observations have been mentioned in a previous treatise by Dr. Jacobsen, for which reason I shall omit to discuss them here.

The investigations to be mentioned here from the surface to the depths which could be reached, comprise altogether 38 stations, of which 26 are situated in the Atlantic and the rest in the Pacific. At some of these stations however we only succeeded in obtaining surface observations. As will be seen from the

SOUTH AMERICA
AFRICA
C. Verde Is.
Group I.
Group II.
Group III.
Group IV.
Group V.
Pernambuco
Callao
(28/5-5/12 1913)
Mollendo
(12/12-28/12 1913)
Tocopilla
(7/12 1913-2/1 1914)
Valparaiso
(14/1-5/1 1914)
Rio de Janeiro
Buenos Aires
Falkland Is.
South Georgia
C. Horn
1/6 1914.
13/6 1913.
Signs.
The „Viking's" route with hydrographic station 12 in group II.
The „Viking's" route and position at apparent noon May 10th.
The arrow represents the average set of the current, and the dot indicates the mean place of the observations. The length of the arrow gives the average drift in nautical miles per day on the annexed scale.
10 5 0 10 20 30 nautical miles
scale of drift per day
SE. Observed limit of the Southeast-trades June 10th.
100° W. f Greenwich

Chart representing the »Viking«s route.

accompanying chart representing the »Viking«s route, I have divided the observations into 5 groups.[1]) The part of the »Viking«s route which comprises all the groups is represented by an unbroken line, and the stations marked by circles with erect Arabic numerals, while the rest is stippled. The small lines across the route indicate the position of the ship at noon with the dates given in italics.

[1]) Group I comprises the Stations 1 to 4 both incl.
— II — - — 5 - 13 —
— III — - — 14 - 26 —
— IV — - — 27 - 35 —
— V — - — 36 - 37 —

Besides the surface observations for each separate group, ca. 60 others were undertaken, when it was impossible to obtain observations from the depth, for reasons which will be mentioned later on. The positions of these stations have not been indicated on the chart in any special way. During the whole voyage, when the weather allowed astronomical observations to take place by comparison between the observed and presumed noon place, there were moreover undertaken calculations concerning the drift of the ship caused by the surface current in the last 24 hours. The current arrows in the chart refer to the mean values of the drift represented in Tables 3 and 4. The observed limits for the trade-winds are moreover indicated with dates when passed, as well as dates for arrival and departure from harbours. In the calculation of the mean values of the drift I have in each case only included observations taken in a period not exceeding 10 days, extending over a distance of ca. 10° in lat. with north-southern courses or ca. 10° in long. with east-western courses, but in several cases extending over considerably shorter distances and periods, e. g. in places where the observations have shown the setting of the current to be essentially changed, or where the sailing has taken place between adjacent harbours as on the west-coast of South America. [1])

On Maj 26th 1913 the »Viking« arrived off Start Point in the Channel on her voyage from Rotterdam to Callao, towed by steam tug. On the same day the latter left the »Viking« which hereafter was entirely dependent on her sails. On June 3rd the practice of the hydrographical observations commenced. They were continued till June 14th when the ship had reached 16° N. Lat. and 28 W. Long. Here we started the observations represented in Group I p. 20. Observations were taken every second day between 1 and 2 p. m. from the surface and to depths of 2—300 metres. On June 18th we took, in calm weather, a series of observations in the morning reaching depths to 450 metres. Another series was taken in the afternoon with depths down to 550 metres. In all the observations of this group and also for the rest the wind was recorded and the temperature of the air with an ASSMANN's aspirations-thermometer No. 718. Fig. 1 shows a vertical section cutting the surface of the water in the wake of the ship. In the section the isotherms and isohalines have been put down. The section shows plainly the great decrease in temperature which takes place in the upper layers of ca. 100 metres, especially in the vicinity of the Equator. The amount of salinity also shows considerable changes downwards. Between 16° N. Lat. and 6° N. Lat. there is a zone with a maximum of salinity and specific gravity near to the surface. As will be seen from the synoptic tables Group I, the current between 12° N. Lat. and ca. 8° N. Lat. was only slight and the ship was only set a few miles westward. From noon on the 19th till noon on the 20th the setting was, on the contrary, considerable, namely 20 miles towards S. 30° E. which in accordance with the high temperature and low salinity on the surface is characteristic of the Guinea current [2]). The observations from Station 3 are further represented in Fig. 1 a p. 17 which shows the change in temperature, salinity and specific gravity from the surface to about 550 metres depth.

On June 24th at 4° N- Lat. and 23° 40′ W. Long. I measured at 2 o'clock p. m. the highest surface temperature on the voyage to 27,5°, the setting was slightly eastward.

| | | |

Afterwards the current decreased, but the setting remained continually between South and West.

On July 1st when the »Viking« had reached to about 7° S. Lat. and 28° W. Long. the second series of observations, represented in Group II p. 20, were commenced. Observations were taken here once daily between 1 and 2 p. m. till July 9th, when the south border of the S. E. trade-wind was passed. In the

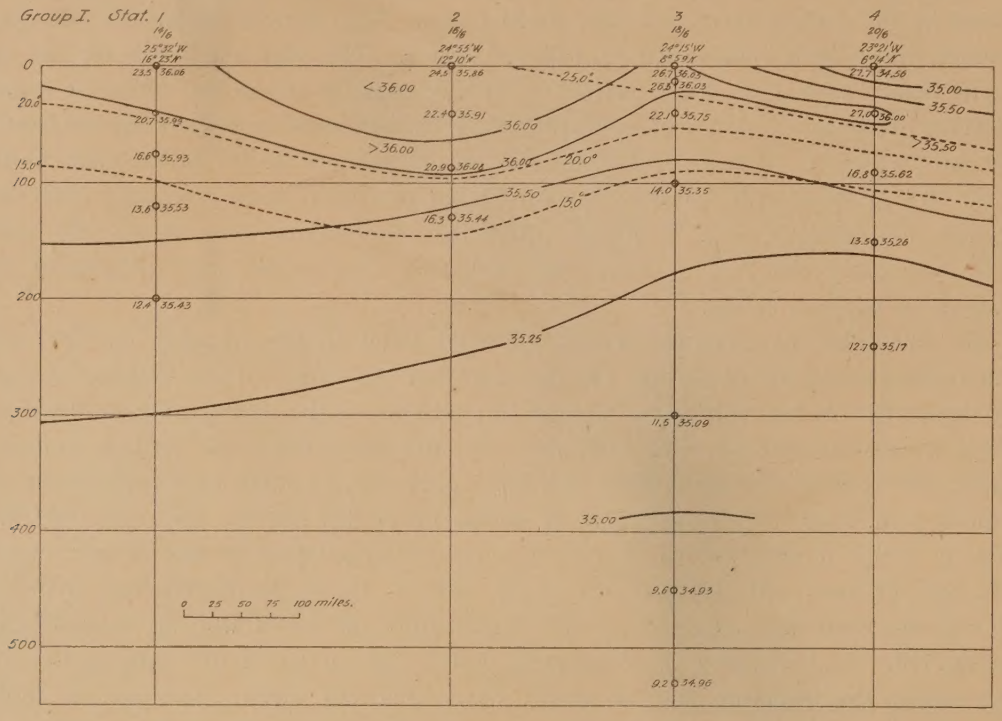


Fig. 1.

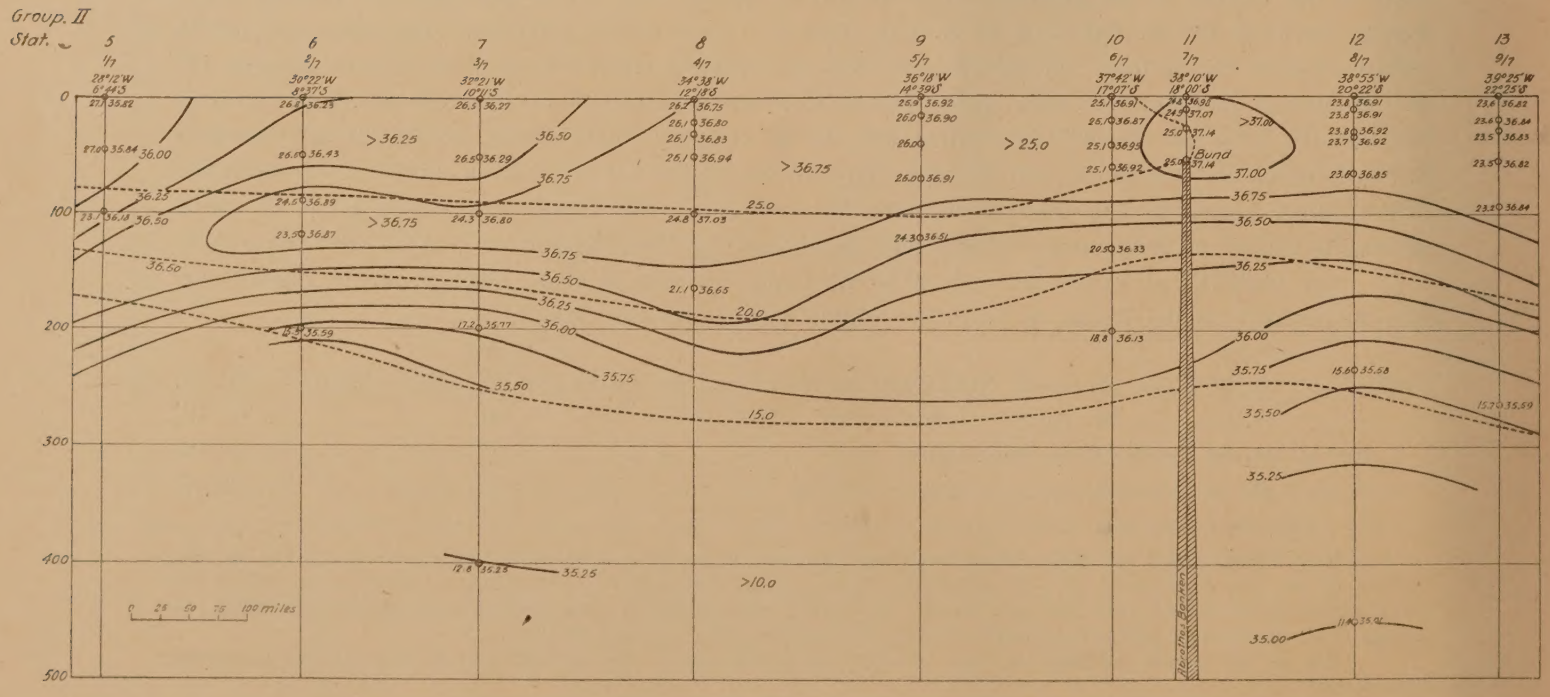


Fig. 2.

same way as for Group I the result of the observations have been represented by a vertical section in Fig. 2. The decrease in temperature downwards is in the upper layers somewhat less than for Group I, and becomes still less gradually as we go south. On July 7th the waterbottle was at bottom at the Abrolhos Bank under the eastcoast of Brazil. The temperature was here some tenths of degrees higher at the bottom than in the surface. In a similar way as north of the Equator a zone occurs between 8° S. Lat. and 10° S. Lat. near to the surface with water of high salinity and specific gravity, which further south rises to the surface, reaching its maximum in the vicinity of Abrolhos with a salinity of more than 37 ‰. Characteristic of this group are the observations from the Stations 6, 7 and 12, which are represented graphically in Fig. 2 a, b and c p. 17, showing an almost constant temperature and salinity at depths to 50 metres, and with regard to the first stations a salinity maximum at 100 metres, depth.

In Annalen der Hydrographie Part 12—1911 Dr. W. Brennecke has stated some results from the German researchsteamer »Deutschland« from a voyage along the east-coast of South America. On board this steamer the salinity maximum at ca. 100 metres, depth quoted here, was also found, as will be seen from the comparison below between the »Deutschland«s and the »Viking«s observations.

	Viking Stat. 6 $^{2}/_{7}$ 13 8° 37′ S. 30° 22′ W.		Deutschland Stat. 70 $^{5}/_{8}$ 11 9° 15′ S. 34° 00′ W.		Viking Stat. 7 $^{3}/_{7}$ 13 10° 11′ S. 32° 21′ W.	
Depth in M.	Temp. °C	S. ‰	Temp. °C.	S. ‰	Temp. °C.	S. ‰
0.....	26,8	36,23	25.82	36,27	26.5	36,27
50.....	26,6	36,43	25,80	36,20	26,5	36,29
100.....	24,3	36,90	25,63	36,60	24,3	36,80
200.....	15,4	35,59	17,68	35,95	17,3	35,77

According to observations made on board, the surface current ran towards South and West with maximum speed in the vicinity of Abrolhos during this series of observations. In the night of July 6th when Abrolhos light-house came in sight it was noticed that the ship from noon til 10 p. m. was set 10 miles to the South. See the synoptic Tables Group II p. 21.

On July 12th when the »Viking« had reached $28^{1}/_{2}$° S. Lat. and $43^{1}/_{2}$° W. Long. the third and last series of observations in the Atlantic commenced. The position of the stations is shown in Group III, which comprises 22 stations, of which however only the 12 have been marked on the chart. The rest includes only surface observations of which several were often taken daily as shown in the synoptic tables Group II and in the vertical section Fig. 3, because it became evident that perceptible changes might take place in the temperature as well as in the salinity on quite short distances. Owing to contrary winds the ship was obliged to cruise, and warm saline water changed with cooler and fresher water at almost the same latitude. In the vertical section Fig. 3 the isodences are also represented.

As will be seen from the section there occurred at 35° S. Lat. and 51° W. Long. at a depth of 200 metres water of the same temperature and salinity as at 33° S. Lat. and 46° W. Long on the surface. Especially remarkable is the strong change in temperature and salinity off La Plata from 35° 13′ S. Lat. and 51° 27′ W. Long. (Station 20) and to 36° 03′ S. Lat. and 53° 22′ W. Long. (Station 21) where temperature and salinity at a distance of ca. 100 miles decreases respectively 9,2° and 2,33 ‰ and this difference is still considerable at a depth of 300 to 400 metres. It is also of interest that the water at 35° S. Lat. (Station 22) at a depth of 200 metres is warmer as well as more saline than at 7° S. Lat. (Station 5) while the surface temperature at the latter station is more than 8° higher. The observations from Station 16 and 19 are represented graphically in Fig. 3 a and 3 b p. 18.

As the research steamer »Deutschland«s (Annalen der Hydrographie Part. 12—1911) Station 90 is situated in the vicinity of the »Viking«s Stations 21 and 22, the following comparison between the »Deutschland«s and the «Viking«s observations concerning temperature and salinity might be of interest.

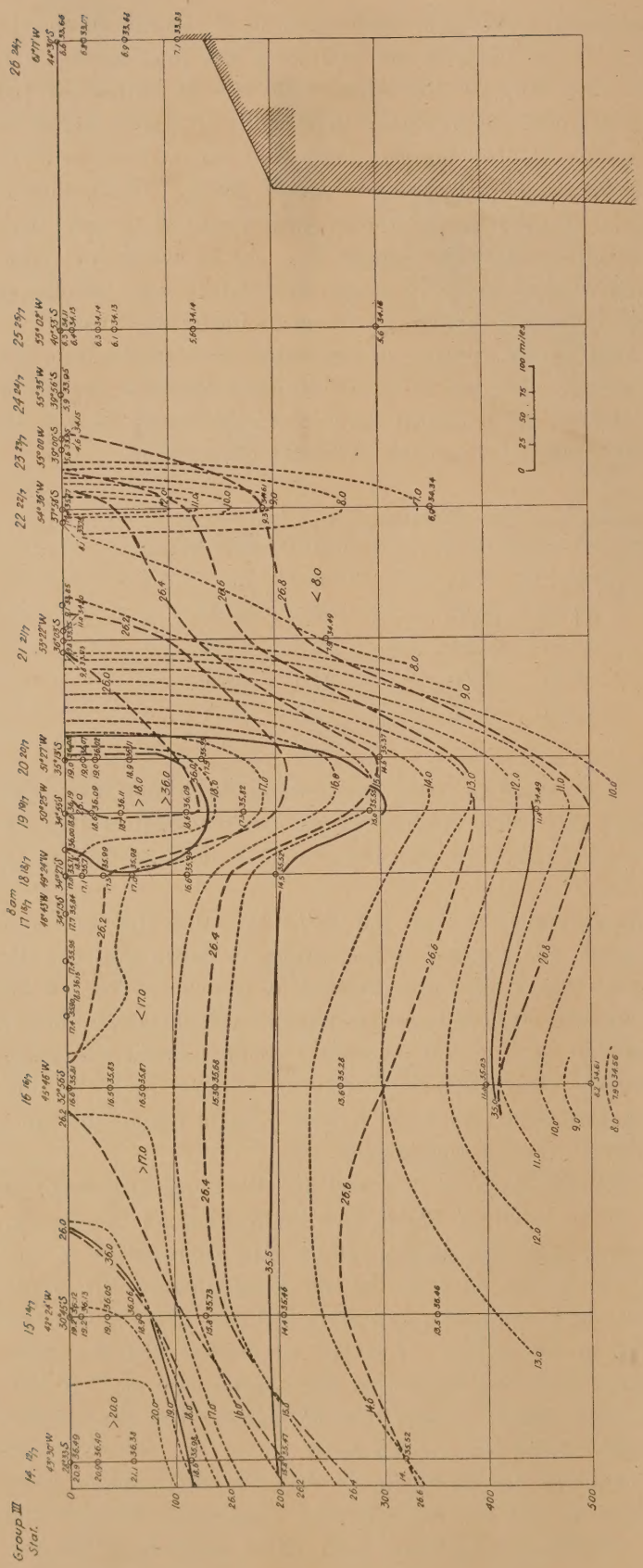


Fig. 3.

Deutschland Stat. 90 $^{28}/_{8}$ 11
34° 33′ S. 48° 04′ W.

Depth in M.	Temp. ° C.	S. $^{0}/_{00}$
0.....	15,05	35,69
100.....	15,05	35,69
200.....	14,97	35,22
300.....	10,11	34,78
450.....	4,9	34,35

Viking Stat. 21 $^{18}/_{7}$ 13
34° 27′ S. 49° 24′ W.

Depth in M.	Temp. ° C.	S. $^{0}/_{00}$
0.....	17,0	35,71
100.....	16,7	35,97
200.....	14,5	35,52

Viking Stat. 22 $^{19}/_{7}$ 13
34° 55′ S. 50° 25′ W.

Depth in M.	Temp. ° C.	S. $^{0}/_{00}$
0.....	18,6	36,19
100.....	18,7	36,08
200.....	16,7	35,73
300.....	14,7	35,52
450.....	11,4	34,99

The strongest setting of the current on the surface was noticed from noon on July 12th till noon 13th (at ca. 29° S. Lat. and 43° W. Long.) when the ship drifted 34 miles towards S. 12° W., and from noon July 14th till noon 15th (at ca. 32° S. Lat. and 44° W. Long.) when the drift was 33 miles towards S. 18° E.

After the 19th we noticed for some days quite a slight drift to North and West, but afterwards the current became changeable.

On July 22nd at 38° S. Lat. (Stat. 22) observations were taken from 350 and 190 metres, depth and the water bottle was then again let down to a depth of ca. 100 metres. A fresh breeze was blowing (W. 6), the »Viking« went under easy sail and with a speed of 3,5, the sea was not particularly heavy. When the waterbottle was hauled in and appeared on the surface of the water, the cover was broken. We succeeded in saving the india rubber flap

and the metal plate at the top, but the upper part of the ebonite tube was broken and the upper part of the cork was lost. The ship's carpenter succeeded however in repairing the damage, and when it was shown to be tight the water bottle was again used at the Stations 25 and 26. It will be seen that the decrease in temperature downwards is very slight at Station 25, and at Station 26 it even rises a little. It should however be remembered here that the observations were taken in winter (July) where the surface water has its lowest temperature. Similar conditions have also been mentioned by Prof. SCHOTT[1]).

During an observation undertaken on July 31st at the Patagonia Bank at a depth of ca. 100 metres, the water bottle struck hard against the bottom, and when it came up several of the screws by which it was attached to the protection frame were broken. The damage however was not worse than that it could be repaired; but when later on in the Pacific, where the surface water became warmer, I noticed that the thermometer when let down in the water bottle might show up to a few degrees more when it was kept in the upper part than in the lower, I let down the closed empty water bottle some fathoms under the surface, where it remained for some minutes. When taken in it was almost filled with water. I discontinued the depth observations on September 19th at 35° 22′ S. Lat. and 77° 35′ W. Long. Though several observations, especially the first of those taken between July 31st and September 19th, by comparison were found to be in accordance with the temperatures at 400 metres' depth, stated in »Stiller Ozean Deutsche Seewarte 1896«, I thought it however best to reject them. The samples were, together with some samples taken later on our way home, kept in the above mentioned bottles with patent lock for eventual titration at home, as I was short of reagents. This was also carried out at the Hydrographical Laboratory in Copenhagen, but the results proved unfortunately that changes by evaporation had taken place in the water in the bottles which owing to an unforeseen prolongation of the voyage had been kept there for more than a year (the last ones from July 18th 1914 till May 21st 1915). Several of the india rubber slices were black. Thus the lock used for the bottles does not seem to be satisfactory for a longer period. None of these samples are included.

During the ship's stay in *Callao* we succeeded in making the water bottle tight, and afterwards during our voyage southwards it was from time to time subjected to different tests. It was lowered closed and empty at 30 metres' depth, remaining for 10 minutes while the ship shot ahead with a speed of 1.5. When brought in and opened we might get some drops of water about 3 à 4 cm.^{3} water out. It was again lowered, but this time open to 30 metres depth and shut at this depth with the lead, after which it was taken up and suspended under a beam. Not till some time had passed did a drop appear at the cork below, after which some seconds might pass between each new dropping.

At last on February 4th it was let down closed and filled with surface water to ca. 90 metres' depth, and when taken up, the temperature of the water in the water bottle and in the surface was measured with the result, that the water in the bottle was 20,6° while the surface water was 21,2°, and the temperature at the quoted depth was previously found to be 15,0°. Owing to the occurring difference in temperature in the water bottle and on the surface, repeated temperature measurements of the surface water took place. These gave the rather remarkable results stated below. It was bright sunshine and calm with some swell at 35° S. Lat. and 92° 30′ W. Long.

ca.	1^{50}	p. m.	at the stern	. . . . .	21,2°	ca.	3	p. m. at the quarter	24,2°
—	2	—	— —	. . . . .	22,3		4	— — —	21,7
		—	— —	. . . . .	21,4			— at the stern	21,6
		—	at the quarter	. . . . .	21,1		5^{30}	— at the quarter	23,5
		—	— —	. . . . .	22,2			— amidships starboard . .	21,0
		—	— —	. . . . .	24,7			— — larboard . . .	22,0
	3	—	— —	. . . . .	25,0			— at the stern	21,4

[1]) Geographie des Atlantischen Ozean. Pag. 130.

The observations which are stated at the same times were made immediately one after another, except the first two which were taken in the waterbottle. The others were taken with a bright tin bucket, which every time was let down ca. $^1/_2$ m. under the surface and remained there for some minutes. I have never measured such a great difference in temperature on the surface at the same place, nor later on during the voyage, where the difference in temperature on the one and other side of the ship did not exceed a few tenths of degrees (2 à 3). The natural conditions were probably on this very day specially peculiar; the sun shone from a sparkling clear sky, no wind moved the whole day, the sea was smooth as a mirror, but the ship pitched all the same in the long soft swells. The temperature of the atmosphere measured at 1. as well as at 2 p. m. 22,3°. According to the position of the ship at apparent noon the set of current was from noon 3rd to noon 4th southward 60° W. 14 miles, and from noon 4th to noon 5th N. 17° E. 2 miles.

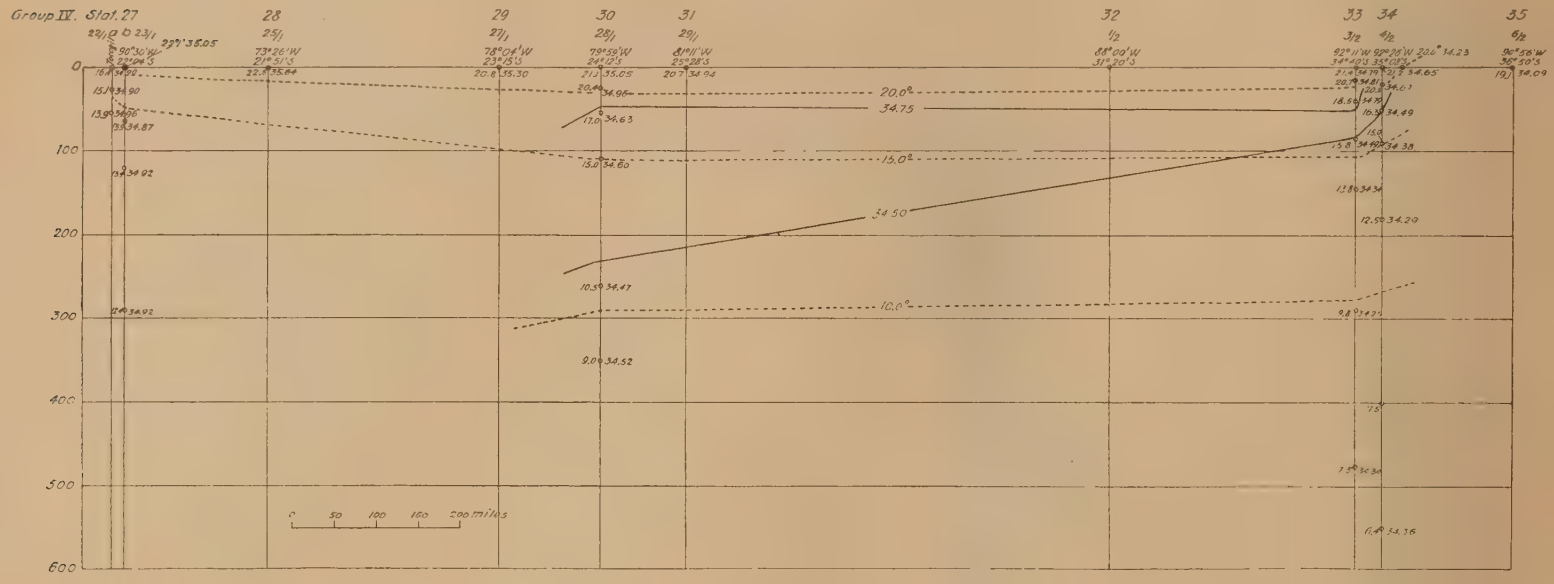


Fig. 4.

In Annalen der Hydrographie Part. 10. — 1912. Dr. Harry Meyer mentions a similar though far lesser change in the temperature of the surface water also in the Pacific. He states as follows:

»Am 31. Oktober (22° S., 116° W.) findet sich in der Wassertemperatur ein Sprung von 1,1°, für welchen die meteorologischen Verhältnisse keine Erklärung geben. Da die Wärme der Luft ebenfalls, wenn auch nur um 0,4° beeinfluszt wird, darf bei dem flauen Winde an die Wirkung von Auftriebwasser gedacht werden.«

During the ship's stay in Valparaiso the water bottle was provided with quite new india rubber plates and corks. It was the Director for the Floating Dock and the Wharf Mr. Krarup, the engineer a Dane, who kindly undertook to have this work carried out at the Wharf, and the waterbottle was thus again in proper condition.

Before I begin to describe the rest of the measurements in the Pacific which were entirely taken on the surface, I shall mention the observations represented in the synoptic tables Groups IV and V p. 26 and 27.

In Group IV, which comprises 9 stations in the Pacific between 22° and 35° S. Lat. as well as various surface observations, the distance between the various stations is unfortunately so great, that the curves for temperature and salinity became rather imperfect as will be seen from the section Fig. IV.

The temperature on the surface increases considerably from the coast and outwards, as on a distance of only 15 miles it rises 5,6° from 16,5° to 22,1°. Then it keeps almost constant out to

75° W. Long., again to decrease a little, but on the rest of the voyage to 92° W. Long. the temperature was almost constant. The depth of the warm water layer is however everywhere only quite inconsiderable. Between the stations 33 and 34 (the upper layers excepted) a rather peculiar decrease in the temperature occurs on quite a short distance southwards, and this difference is still considerable at 500 metres, depth. The decrease in temperature downwards is considerably greater than for the Atlantic stations at the same lat. While we here already at depths of hardly 300 metres find water of 10°, this temperature at the same lat. did not occur in the Atlantic till about 500 metres.

Also the salinity in the surface increases in the beginning outwards to decrease, later especially between the last stations. Close to the coast the salinity increases somewhat with the depth, otherwise it decreases downwards to depths between 300 and 400 metres, after which it again seems to increase. The salinity is lower in the surface as well as deeper down than on the eastcoast of South America at the same lat.

The cold and proportionately not very saline water near to the coast originates probably from the South, but nevertheless the position of the ship at apparent noon gave the result concerning the set of the current that the drift close to the coast was inconsiderable and changing [1]) as will be seen from the tables 3 and 4. Not until we reached 75° W. Long. did we perceive any drift to North and namely to West.

The cold water along the coast is in hazy weather an excellent index of the vicinity of the coast. Towards North — at the lat. of Tocopilla and Mollendo — it appears only to be in the immediate vicinity of the coast that the cold water occurs, while further South — at the lat. of Valparaiso — it reaches further at sea. In Table 1 the temperature of the surface water is indicated on the voyage along the coast, out and in from some harbours.

Table 1.

Date	Place of observations	Time	Temperature		distance of the coast
			atmosphere	water	
1913 $^{11}/_{12}$	16° 12′ S Lat. 74° 13′ W Long.	2 p. m.	20,3	19,1	ca. 20 miles
» $^{12}/_{12}$	16° 55′ » » 72° 48′ » »	2 »	22,9	20,7	» 20 »
$^{13}/_{12}$	Mollendo road	8 a. m.	20,1	16.1	» $^{1}/_{2}$
»	»	2 p. m.	22,3	18.4	» »
$^{15}/_{12}$	17° 48′ S Lat. 71° 38′ W Long.	8 a. m.	21,1	21,1	» 30
$^{16}/_{12}$	19° 22′ » » 70° 52′ » »	2 p. m.	22,3	23,1	» 40
$^{18}/_{12}$	21° 15′ » » 70° 26′ » »	8 a. m.	19,9	19,9	» 15 »
» »	21° 40′ » » 70° 26′ » »	2 p. m.	19,9	19,3	» 10
$^{19}/_{12}$	Tocopilla road	8 a. m.	17,7	16,0	» $^{1}/_{2}$ »
» $^{20}/_{12}$	»	8 »	19,5	15.8	» »
» »	»	2 p. m.	20,3	16,3	» » »
1914 $^{21}/_{1}$	Tocopilla road	2 p. m.	20,0	17,3	ca. 1 miles
» $^{22}/_{1}$	»	8 a. m.	19,5	16,4	» » »
» $^{23}/_{1}$	22° 04′ S Lat. 70° 30′ W Long.	1 p. m.	21,9	22,1	» 10
» $^{24}/_{1}$	21° 50′ » » 71° 06′ » »	2 »	22,8	23,7	» 40
1914 $^{11}/_{2}$	34° 36′ S Lat. 74° 12′ W Long.	1 p. m.	16,7	17,1	ca. 90 miles
» $^{12}/_{2}$	34° 12′ » » 72° 28′ » »	8 a. m.	15,1	14,9	» 25 »
» $^{13}/_{2}$	33° 0′ » » 71° 50′ » »	7 »	ca. 19	14,0	» 8
» »	Valparaiso road	2 p. m.	30.9	15,9	
» $^{14}/_{2}$	»	8 a. m.	15,1	13,7	at anchor
1914 $^{8}/_{4}$	Valparaiso road	4 p. m.	19,7	15,4	
» $^{9}/_{4}$	32° 35′ S Lat. 74° 28′ W Long.	2 »	15,1	16,8	ca. 140 miles
» $^{10}/_{4}$	32° 45′ » » 78° 00′ » »	2	15,9	17,4	» 300 »
» $^{11}/_{4}$	33° 15′ » » 81° 10′ » »	8 a. m.	16,3	18,8	» 450

[1]) During the ship's stay in Tocopilla roads the drift was only quite a few miles pr. day, and according to the observations always towards the coast.

The observations from Stat. 27 b are moreover represented in Fig. 4 a p. 18. Group V comprises really not more than two depth observations, the Stations 36 and 37. As these stations howewer are situated close to Station 33 and 34 from Group IV, they have been included in the vertical section in Fig. 5 in order to procure a better view concerning the changes in temperature and salinity with the depth. It should be noticed that a layer of proportionately slight salinity occurs between ca. 200 and 500 metres' depth. Especially remarkable are moreover the conditions in the surface at Station 37 with proportionately low temperature and salinity and at Station 33 with proportionately high temperature and salinity. The observations from Station 37 were taken in April, while those from Station 33 were taken in February. The results of the depth observations are moreover represented in Fig. 5 and in 5 a, 5 b, 5 c and 5 e from the Stations 33, 34, 36 and 37 (see p. 18 and 19).

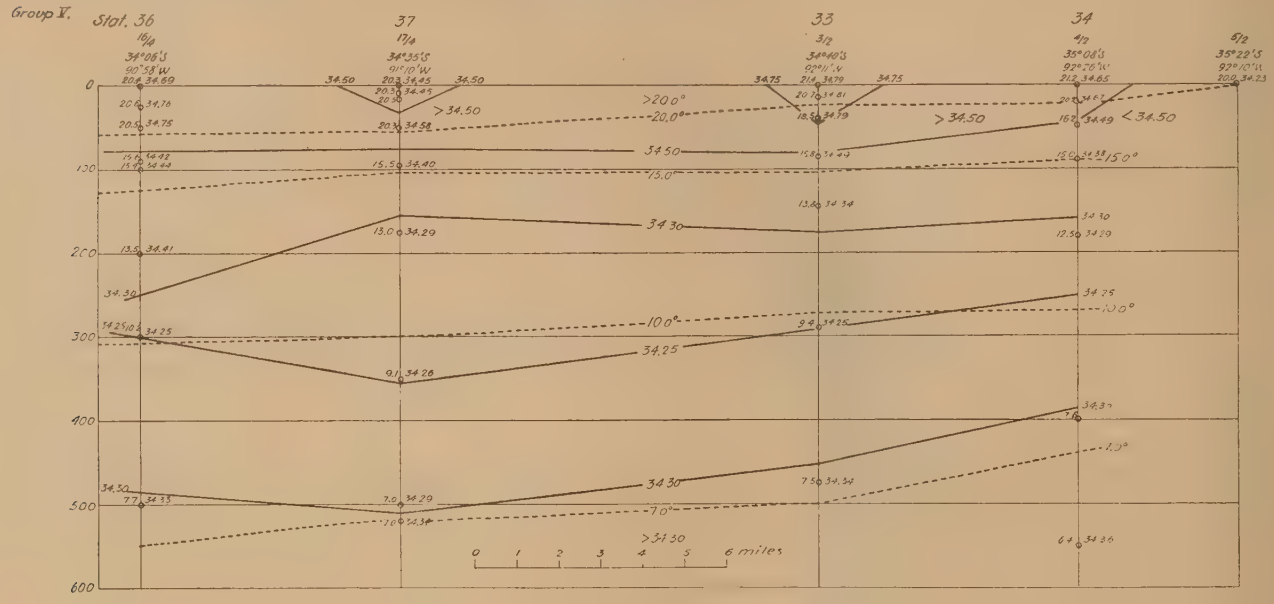


Fig. 5.

On the accompanying chart Fig. 6 the surface observations in the Pacific concerning the salinity are represented and indicated in $^0/_{00}$. On the chart the curves in unbroken line represent isohalines from »Stiller Ozean 1896 Deutsche Seewarte« while the stippled curves indicate the corresponding isohalines according to the investigations of the »Viking«. As will be seen from the synoptic tables concerning the single observations these originate partly from August—September 1913 (the underlined ones) partly from December 1913 and from February—April 1914.

Under Cape Horn the weather was during our outward route unusually stormy with winds predominantly between SW. and NW., and it did not take less than 6 weeks from July 31st to September 11th to sail from 50° S. Lat. in the Atlantic to the same lat. in the Pacific. Under these conditions it was only possible at long intervals to obtain a reliable astronomical observation, for which reason the set of the current could not be determined. The lowest surface temperature — 0,9° noticed on the voyage was measured on August 7th at 8 a. m. at 55° 48′ Lat. and 63° 50′ W. Long. Already the same day at 1 p. m at 56° 30′ S. Lat. and 64° 14′ W. Long. the temperature was in the surface + 3,7°. The temperature of the atmosphere was respectively at the two observations + 0,9° and + 2,9° and the wind respectively NNE. 6 and NE. 8. According to the daily observations the temperature of the surface water was generally between 3° and 4°, and usually a little higher than that of the atmosphere, which even on August 20th at $59^1/_2$° S. Lat. and $73^1/_4$ W. Long. decreased below zero (8 a. m.—0,4° and at 2 p. m.—0,7°) with a storm from South West, while the temperature of the surface water was + 3,5°.

In the night between September 26th and 27th between 13° and 14° S. Lat. and at 77½ W. Long. we observed a peculiar phenomenon. Coming on deck at 8—30 p. m., the wind was SE. 2, the sky was slightly clouded, and the brightest stars looked a little misty. Down at the horizon the sky was, especially in the South — covered with dark clouds, while a rather conspicuous light appeared in the East. That which however filled us with wonder and even with awe was the appearance of the sea. As far as the eye could reach, the surface of the sea was shining diffusively with a milky, perhaps greenish gleam, the high sea which had lasted all the day long had subzided. Especially in the South the sharp contrast between the dark sky and the shiny white sea looked strange, while the transition between atmosphere and water was less distinct in the North. At times we could notice quite black spots in the white surface close to the ship. Apart from the heat, we had almost the impression of staying in a desolate snow-field during a winter night, where the atmosphere threatens more snow. On the previous night between 10 and 11 we had observed something similar, but much fainter, and in the afternoon on the 26th I had noticed that the sea had a peculiar greenish aspect, and was to a great extent covered with yellowish foam spots. In the afternoon as well as in the evening samples were taken of the water. It will however be seen from the tables page 24 that these did not give any extraordinary result. A microscopical investigation undertaken by the surgeon, Mr. Halberg, gave the following result. »We notice something, undoubtedly »Flaggelata« (*Noctiluca* and similar) the majority of a light blue tint, moreover some small rectangular clear crystals and a few larger polygonal and irregular contaminations in the shape of larger black flakes without distinct structure«. The phenomenon lasted throughout the night, but was probably most conspicuous about midnight.

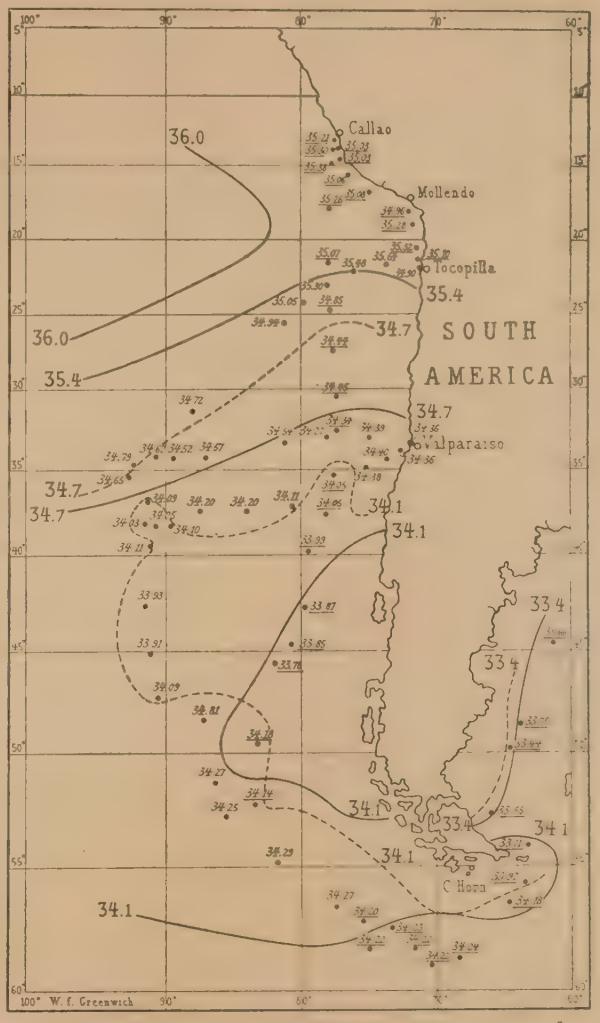


Fig. 6.

The following account in »Annalen der Hydrographie« Part IX 1914 shows the quoted phenomenon not to be unique:

»Capt. D. Niemann, Führer der Rostocker Bark »Frida Mahn«, auf der Reise von Callao nach Tacoma befindlich, berichtet in seinem für die Deutsche Seewarte geführten Tagebuche unter dem 24. August 1913, als sich das Schiff in etwa 11°20′ S. Lat. und 81°13′ W. Long. befand, das Folgende: »Seit 6¾ p. m. ist das Wasser milchig gefärbt, so dass das Schäumen der See nur im allerersten Augenblick sichtbar war. Diese eigenartige Erscheinung machte den Eindruck, als wenn das Wasser ganz mit Schnee bedeckt wäre, ebenso ist auch die Luftfärbung, als wenn bedeckte Luft über einer Schneelandschaft läge. Diese Färbung hielt die ganze Nact an, erst bei Tage verschwand sie oder war nicht mehr zu sehen«.

It will be seen that a month only has passed between the two observations which both originate from rather adjacent regions. (Is it possible that there may be a question about a movement in the water?) Similar phenomena were not noticed further North from the »Viking«.

The last experiment with the water bottle was undertaken on our way home from Valparaiso on August 22nd 1914 at 2 p. m. at 38° 40′ S. Lat. and 91° 03′ W. Long. The weather was fine with a high swell, the speed was 1,5. Samples were taken in the surface at 10 metres, 40 metres and 110 metres depth, after which a sample should be taken from a depth of 200 metres. On paying out the line the ship sat with her stern in the sea, the line checked and to prevent it from getting out of order on the roll we had to use the brake violently. As the stern directly after this went up, we did not succeed in loosening the brake at the same moment, and the line went tight with a jerk. When we immediately after this let go the brake, the line would not run, and it became apparent that it was broken 40—50 metres above the water bottle, which was down at a depth of ca. 100 metres.

The results from this last station are not represented in the vertical section Group 5 for want of room.

Later on some attemps to obtain samples were made with an isolated bottle with a lock of special construction; but as it could only be used at quite small depths in calm weather, and as the water in the bottle could not be perfectly shut out from the surroundings, these experiments did not lead to any efficient result.

In Tocopilla as well as in Valparaiso a series of observations were taken while the ship was at anchor. To save titration reagents only some of the samples were titrated and the results have been put in Table 2.

Table 2.

Date	Time	Wind	Temperature atmosphere	Temperature water	Salinity ‰	σt	depth in m. and remarks
Observations from Tocopilla. 22° 05′ S Lat 70° 14′ W Long.							
27/12 1913	h m 2 0 p. m.	SW 2	19,5	15,3	34,87	25,82	0 at anchor
				14,5	34,92	26,04	6
				13,1	34,97	26,38	28
28/12 »	8 0 a. m.		18,7	15,5	34,87	25,78	0
				13,2	34,92	26,31	35 bottom
30/12 »	8 0 »	calm	21,9	14,9	34,88	25,92	0
				13,5	34,92	26,25	37 bottom
3/1 1914	8 0 »		20,1	16,1	34,88	25,66	0
				14,7	34,96	26,02	20
				14,2	34,94	26,12	36 bottom
3/1 »	2 0 p. m.	SW 2	19,9	16,7	34,92	25,54	0 the water reddish
				14,1	35,05	26,21	37 bottom
6/1 »	8 0 a. m.	WSW 1	19,7	15,8	34,97	25,79	0
				14,5	34,99	26,09	21
				14,1	34,88	26,09	37 bottom
6/1 »	2 0 p. m.	SW 2	20,7	16,5	34,94	25,61	0
				14.8	34,96	26,00	20
				13,8	34,88	26,13	37 bottom
Observations from Valparaiso. 33° 01′ S Lat 71° 37′ W Long.							
12/2 1914	h m 6 30 a. m.	WSW 4	?	14,0	34,36	25,71	0 ca. 8 miles from the coast
	9 30 »	WSW 3	19,5	13,3	34,49	25,95	10 Valparaiso
	» »	»	»	12,9	34,51	26,05	15 »
	» »	»	»	12,2	34,54	26,22	38 »
	» »	»	»	12,1	34,54	26,24	70 » bottom
14/2 »	8 0 »	»	15,1	13,7	34,36	25,77	0
	»	»	»	13,3	34,54	26,00	7 »
	»	»	»	12,5	34,54	26,16	20 »
	» »	»	»	12,0	34,61	26,31	68 » bottom

The following information concerning the conditions of temperature in atmosphere and water in the Tocopilla Roads may possibly be of some interest in spite of the too small material of observation.

The mean temperature	Atmosphere	Surface water	Bottom 37 m
8 a. m. (8 observations)	20,22°	16,36°	13,94°
2 p. m. (7 —)	20,86°	16,86°	13,80°
Diff. in temp. between 2 p. m. & 8 a. m.	+ 0,64°	+ 0,50°	— 0,14°

When the »Viking« in the beginning of May had passed Cape Horn on her voyage home to Europe, the daily surface observations were continued. As mentioned on page 9 the water could not stand the long keeping in the bottles and thus the salinity cannot be indicated. The other observations may be found in Table 5. The observations were taken daily at 8 a. m. and 2 p. m. The statements concerning wind and temperature in atmosphere and water which have been put down by each date, are mean values of both observations. The quoted temperatures on the surface of the water on the whole fully accord with the isotherms for May represented in Geographie des atlantischen Ozean by G. Schott. Great changes in the temperature occurred especially on May 11th at 49° S. Lat. and 53° W. Long., when the temperature increased 6·1° in hardly 2 hours, namely from 5·4° at 1^{15} p. m. to 11·5° at 2 p. m. Strange enough there was at the same time a strong drift between North and West. On May 17th at 42° S. Lat. and 37° W. Long. the temperature of the surface water changed somewhat, being at 4 a. m. 11° at 7 p. m. 15,3° with drift against ESE. see Table 3. On our outward route we measured the greatest oscillations in the surface of the water between 35° and 38° S. Lat. and 51° and 56° W. Long. On July 20th (1913) the temperature was at 6 p. m. 18,2° and on the next day at 8 a. m. 9,8°. In the meantime the course was true S. 62° W. and the distance 102 miles.

On July 22nd the temperature was at 8 a. m. 8,1°, at 1^{45} p. m. 14,4°, and the next day at 8 a. m. 5,6°. Between the first two stations the distance was 10 miles and between the last two ones 65 miles. See Group III in the synoptic tables.

With regard to the observations concerning the set of current in the Atlantic, I may remark that on our outward route as well as on our way home we succeeded in observing an easterly current (the Guinea current) between 5° and 10° N. Lat. and on our way home, even West of 30° W. Long., which however is not unusual in June. The Brazilian current could be pointed out till 35° S. Lat., as mentioned above we measured also high surface temperatures further South. On our way home we met already at 30° S. Lat. and 26° W. Long. with strong westerly currents with temperatures above 20°, which characterizes the southern Equatorial current. At Cape Horn the set of current was normal but further North we met with an unusual strong northern drift, thus at 49° S. Lat. and at 53° W. Long., more than 40 miles in 24 hours towards N. 9° W. Characteristic of the current observations in the Pacific is the slight speed with which the cold water moves along the coast. The most vigorous northerly current occurred between 75° and 80° W. Long. Further West the current moved through West and South and then eastward. South of 50° S. Lat. and between 80° and 85° W. Long. we observed currents going towards ENE. with a speed of up to 25 miles per 24 hours. The absolutely strongest drift that occurred on the whole voyage was observed under the Equator in the Atlantic at 24° W. L. where it was 41 miles per 24 hours. On our way home we met in the same region with strong westerly currents.

All directions stated in the tables are true. The force of wind was determined by judgment according to Beaufort Scale (0—12). The instruments employed were examined at the Hydrographical Laboratory of Copenhagen. In my statements I have considered the corrections. 1 mile = 1852 m.

Table 3.

Mean values for set of currents in 24 hours in the Atlantic. [1])

Nr.	Date	Place	Date	Place	Number of observations	Current	Mean place
			June—July 1913.				
1	13/6	19,4° N Lat. 25,5° W Long.	18/6	8,9° N Lat. 24,3° W Long.	5	N 88° W 5,7 miles	13,5° N Lat. 25,0° W Long.
2	19/6	8,4° » » 23,9° » »	23/6	4,8° » » 23,7° » »	2	S 64° E 13,0 »	6,3° » » 23,6° » »
3	26/6	3,1° » » 21,3° » »	30/6	4,8° S Lat. 20,5° » »	4	» 63° W **33,3** »	0,8° S » 24,5° » »
4	30/6	4,8° S Lat. 26,8° » »	5/7	14,5° » » 36,1° » »	5	» 50° » 11,3 »	9,5° » » 31,4° » »
5	5/7	14,5° » » 36,1° » »	11/7	26,3° » » 42,1° » »	6	» 45° » 14,1 »	20,4° » » 38,9° » »
6	11/7	26,3° » » 42,1° » »	18/7	34,5° » » 49,4$_0$ » »	7	» 6° E 13,8 »	31,1° » » 44,8° » »
7	18/7	34,5° » » 49,4° » »	28/7	44,5° » » 61,3° » »	9	» 84° » 3,7 »	39,2° » » 54,9° » »
8	28/7	44,5° » » 61,3° » »	2/8	51,5° » » 64,6° » »	5	» 10° W 15,6 »	48,4° » » 63,5° » »
			May—June 1914.				
22	6/5	56,4° S Lat. 59,6° W Long.	12/5	47,1° S Lat. 50,8° W Long.	6	N 17° W 17,1 miles	52,4° S Lat. 55,9° W Long.
23	12/5	47,1° » » 50,8° » »	30/5	37,2° » » 29,8° » »	6	S 85° E 14,9 »	42,7° » » 40,1° » »
24	22/5	32,0° » » 26,9° » »	30/5	17,8° » » 25,7° » »	8	N 58° W 13,8 »	23,3° » » 25,7° » »
25	30/5	17,8° » » 25,7° » »	5/6	4,7° » » 28,0° » »	6	» 71° » 16,4 »	11,4° » » 27,0° » »
26	5/6	4,7° » » 28,0° » »	10/6	5,5° N Lat. 30,3° » »	5	» 65° » 21,6 »	0,5° N Lat. 29,4° » »
27	10/6	5,5° N Lat. 30,3° » »	12/6	7,7° » » 30,7° » »	2	» 37° E 12,5 »	6,6° » » 30,4° » »
28	12/6	7,7° » » 30,6° » »	17/6	19,2° » » 39,8° » »	5	S 69° W 5,2 »	13,2° » » 35,4° » »

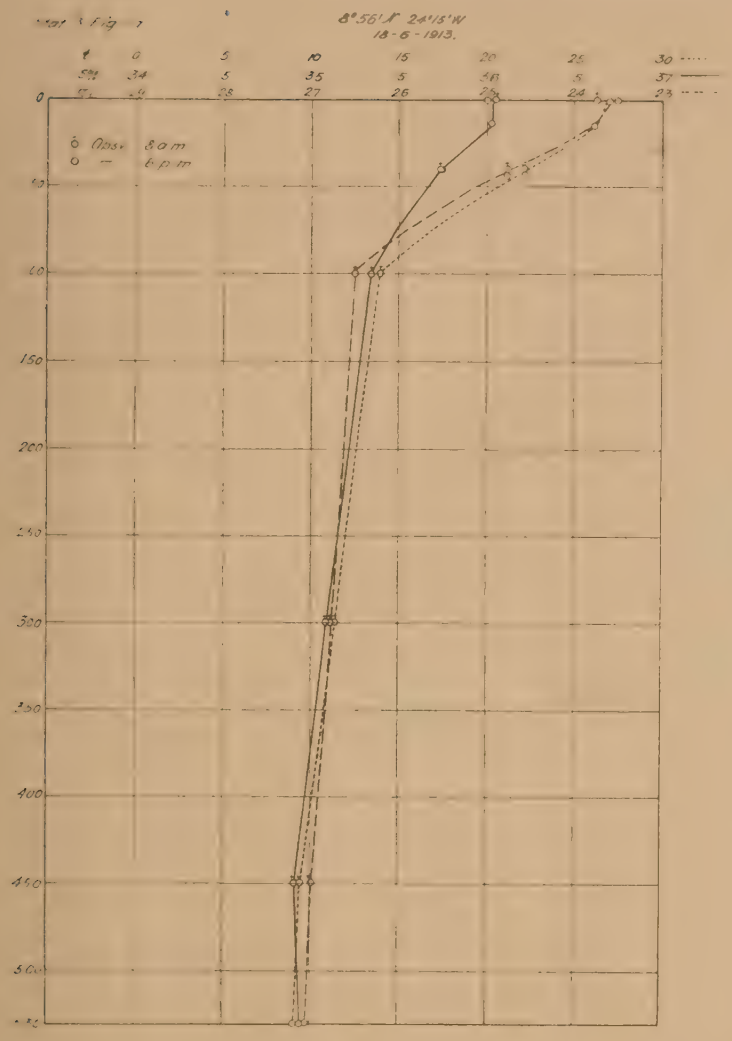
Table 4.

Mean values for set of currents in 24 hours in the Pacific. [1])

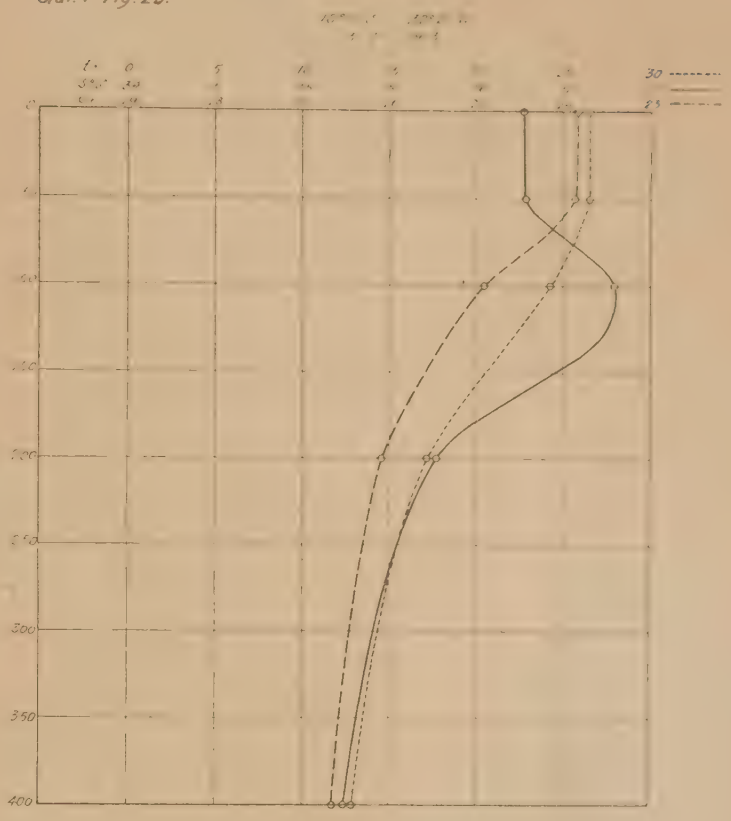
Nr.	Date	Place	Date	Place	Number of observations	Current	Mean place
			June—July 1913.				
9	7/9	58,0° S Lat. 77,8° W Long.	12/9	46,9° S Lat. 83,2° W Long.	5	N 27° W 10,1 miles	53,3° S Lat. 81,9° W Long.
10	15/9	43,8° » » 79,6° » »	20/9	32,8° » » 77,5° » »	3	» 19° E 10,9 »	38,5° » » 78,5° » »
11	20/9	32,8° » » 77,6° » »	24/9	21 6° » » 78,0° » »	4	» 38° W 14,9 »	27.5° » » 77,7° » »
12	24/9	21,6° » » 78,0° » »	27/9	12,8° » » 77,6° » »	3	» 2° » 8,7 »	16,9° » » 77,8° » »
			December 1913—February 1914.				
13	7/12	13,0° S Lat. 77,0° W Long.	12/12	16,9° S Lat. 72.9° W Long.	5	N 24° E 0,5 miles	14,9° S Lat. 75,4° W Long.
14	14/12	Mollendo road	18/12	21,6° » » 70,4° » »	4	S 55° W 2,6 »	19,2° » » 71,1° » »
15	23/1	22,1° S Lat. 70,5° W Long.	25/1	21,8° » » 73,2° » »	2	N 37° » 3,2 »	21,9° » » 71,6° » »
16	25/1	21,8° » » 73,1° » »	30/1	27,5° » » 83,6° » »	5	» 74° » 11,6 »	24,2° » » 78,8° » »
17	30/1	27,5° » » 83,6° » »	4/2	35,1° » » 92,4° » »	5	S 32° » 12,3 »	31,9° » » 88,8° » »
18	4/2	35,1° » » 92,4° » »	7/2	37,5° » » 86,9° » »	3	» 88° E 10,1 »	36,3° » » 90,4° » »
19	7/2	37,5° » » 86,9° » »	11/2	34,6° » » 74,3° » »	4	N 55° » 15,9 »	36,7° » » 80,3° » »
			April 1914.				
20	10/4	32,7° S Lat. 74,8° W Long.	16/4	34,1° S Lat. 91,0° W Long.	6	N 71° W 9,5 miles	33,9° S Lat. 85,6° W Long.
21	16/4	34,1° » » 91,0° » »	22/4	38,7° » » 91,0° » »	6	S 50° E 6,3 »	37,0° » » 91,1° »
22	26/4	47,5° » » 90,6° » »	30/4	55,2° » » 80,5° » »	3	N 66° » 14,0 »	51 2° » » 85,9° » »
22 a	30/4	55,2° » » 80,5° » »	5/5	56,4° » » 59,6° » »	1	» 85° » 10,9 »	56,5° » » 69,6° » »

[1]) The results are represented graphically page 4.

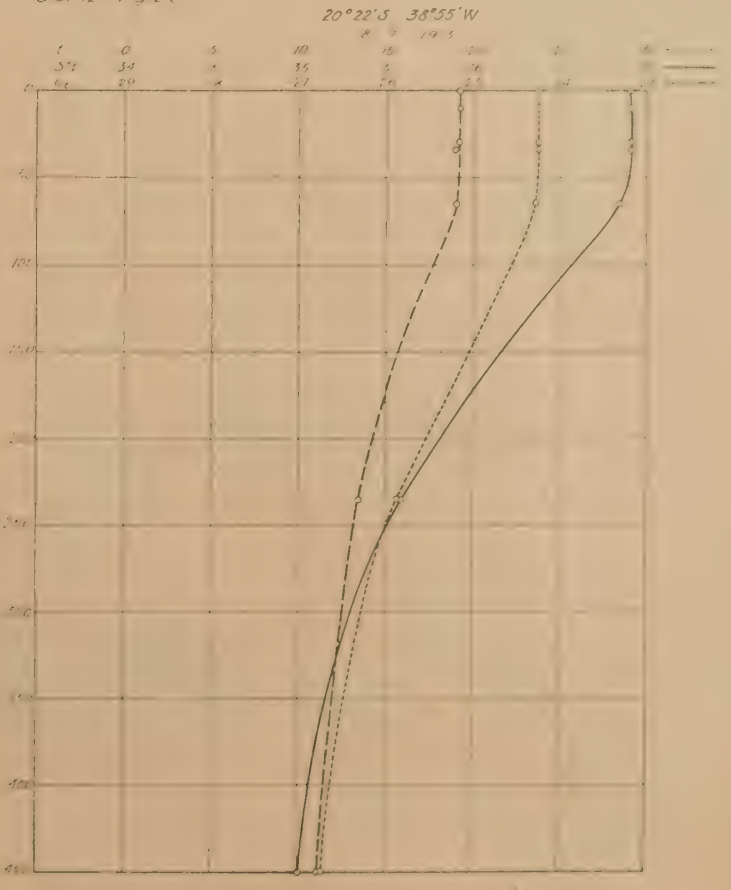
Diagrams showing temperature, salinity and σ_t at various depths

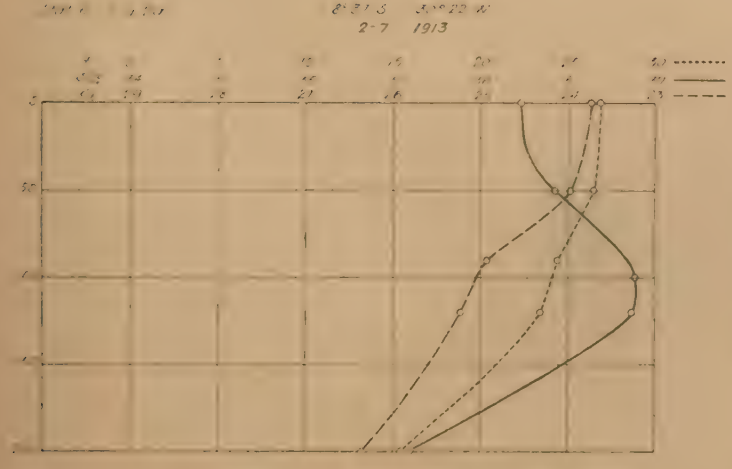


Stat. 7 Fig. 2b.

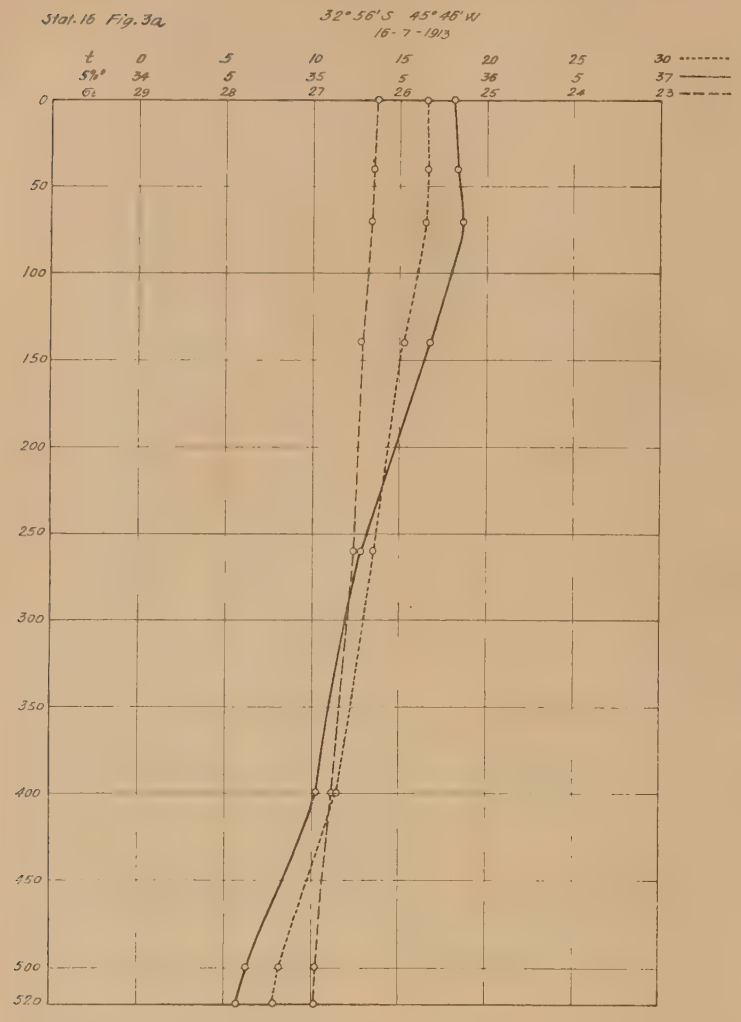


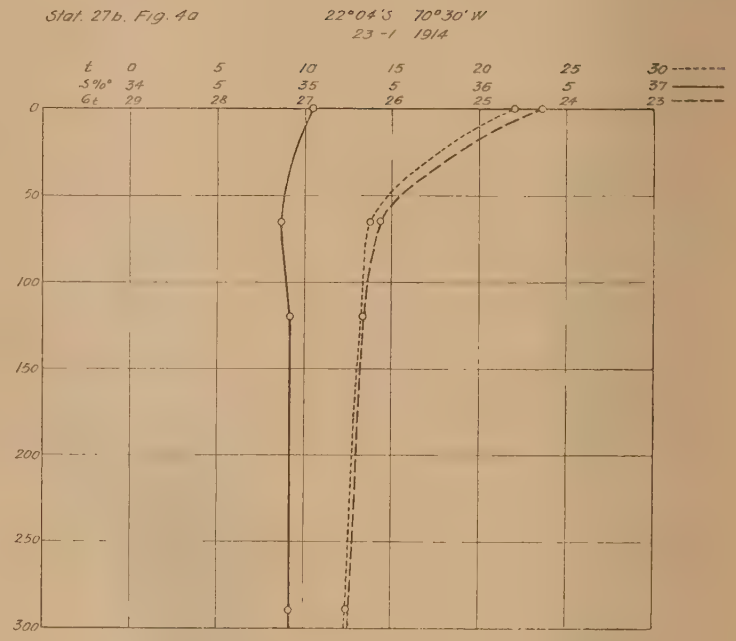
Stat 12 Fig. 2c

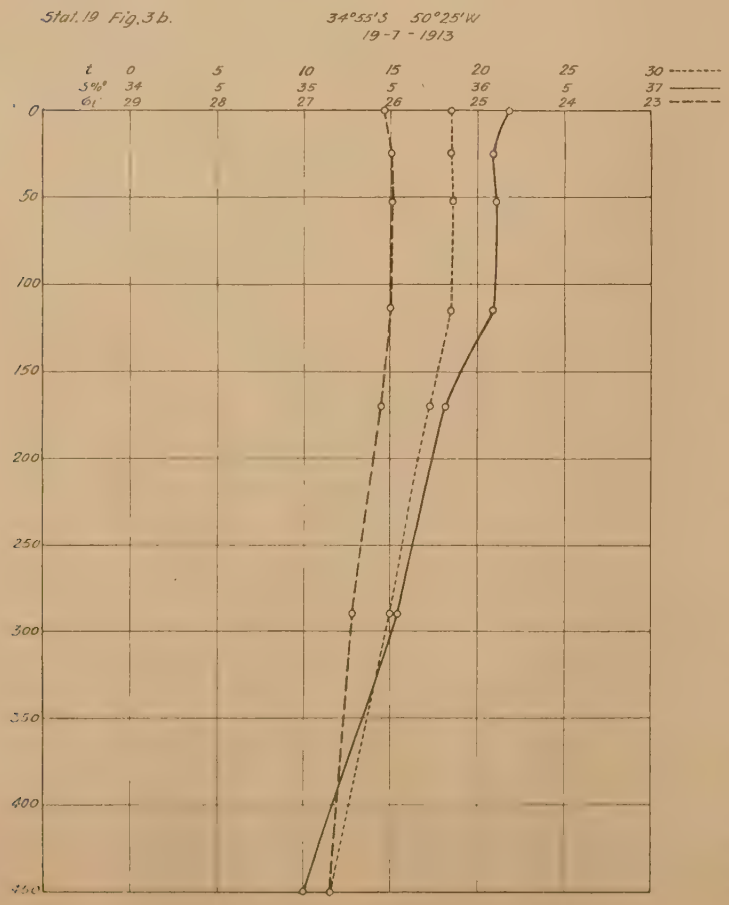


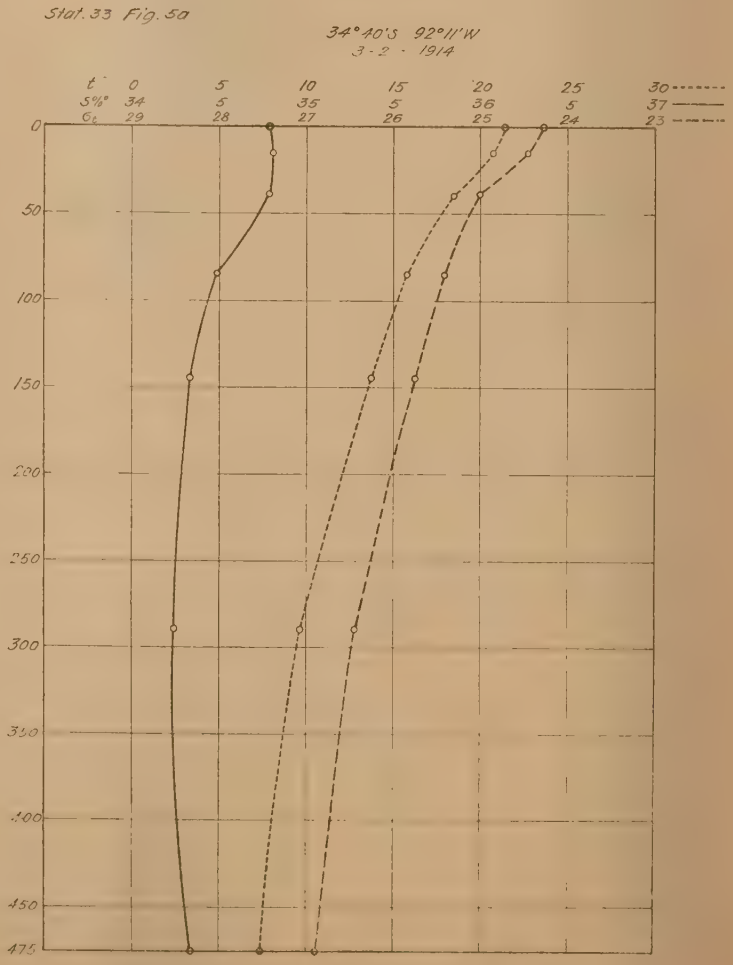


Diagrams showing temperature, salinity and σ_t at various depths.

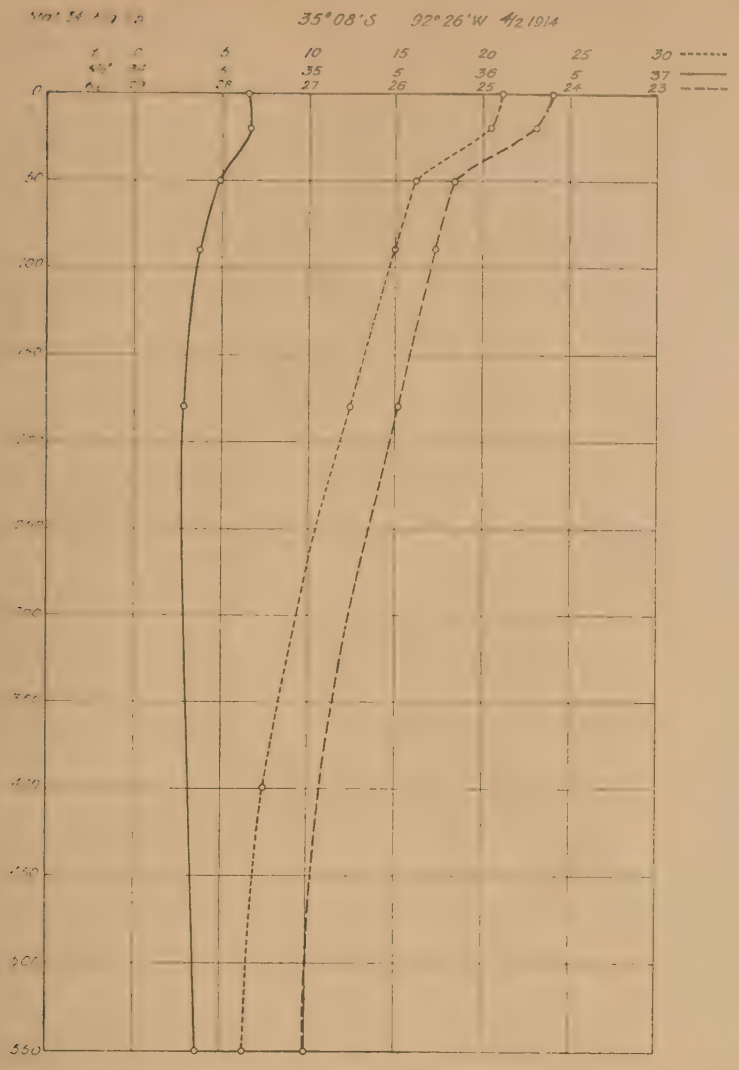


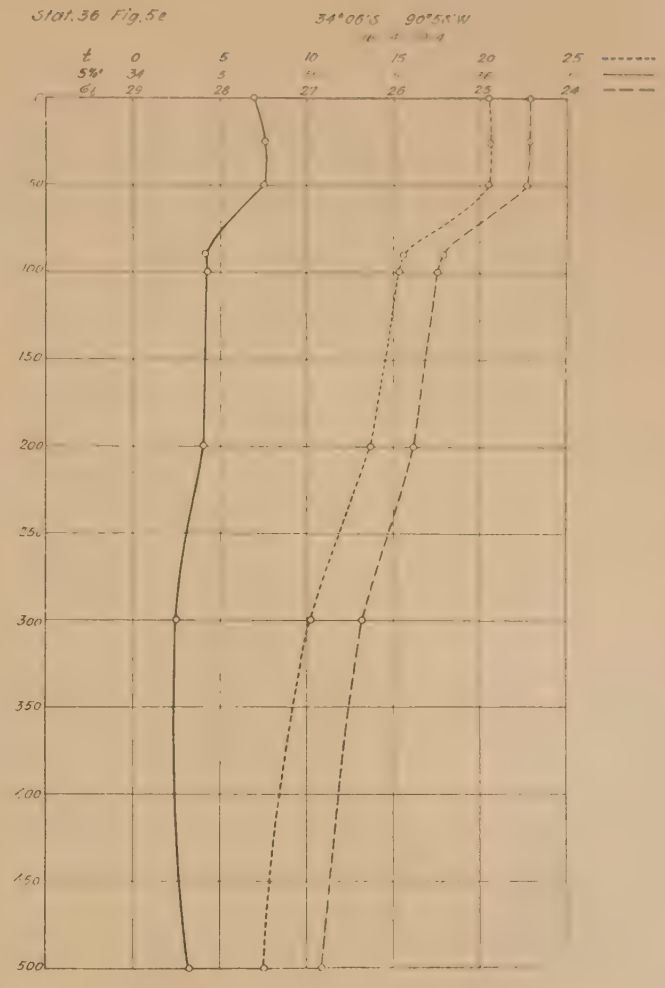


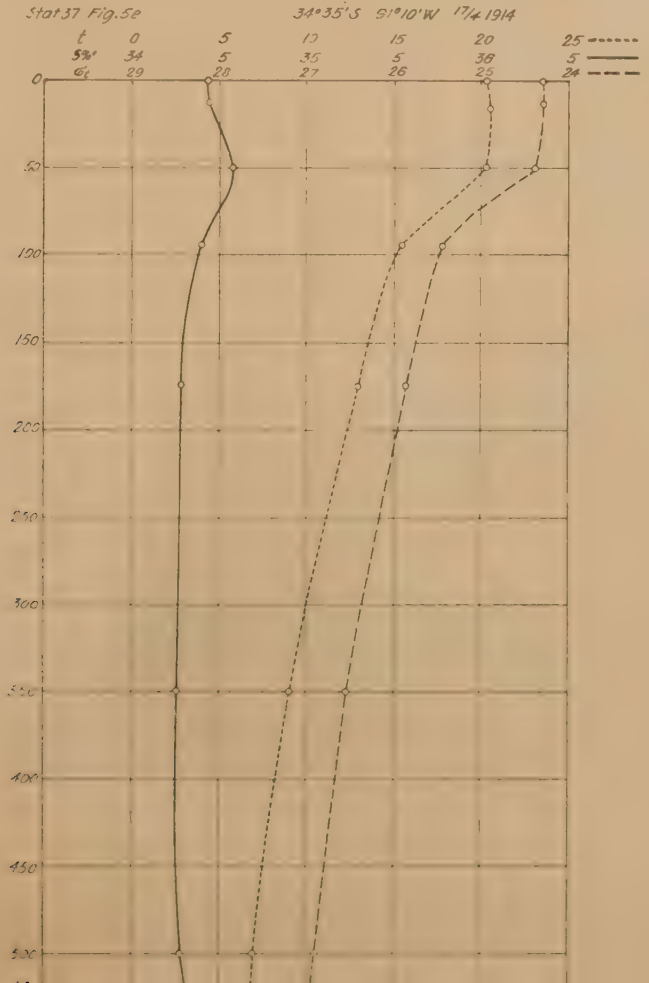




Diagrams showing temperature, salinity and σ_t at variuos depths.







Synoptic Tables with statement of the Observations at each station and some other places.

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
			Group I.						
	h m	No. 1						m	
14/6 1913	2 30 p. m.	16° 23′ N Lat.	NNE 1	22.5	23,5	36,06	24,61	0	N 63° W 13,5 miles
	2 20 »	25° 32′ W Long.	»	»	20,7	35,99	25,34	40	
	2 10 »	»	»	»	16,6	35,93	26,35	75	
	1 55 »	»	»	»	13,6	35,53	26,70	145	
	1 40 »	»	»	»	12,4	35,43	26,86	200	
		No. 2							
16/6 1913	1 45 p. m.	12° 10′ N Lat.	ENE 3	23,9	24,5	35,86	24,16	0	N 74° W 7,3 miles
	1 35 »	24° 55′ W Long.	»	»	22,4	35,91	24,81	40	
	1 25 »	»	»	»	20,9	36,08	25,35	85	
	1 05 »	»	»	»	16,3	35,44	26,04	130	
		No. 3							
18/6 1913	8 25 a. m.	8° 57′ N Lat.	calm	25,3	26,3	36,06	23,76	0	S 45° W 1,5 miles
	8 12 »	24° 15′ W Long.	»	25,5	22,1	35,74	24,77	40	
	8 06 »	»	»	»	14,0	35,35	26,48	100	
	7 50 »	»	»	»	11,5	35,09	26,78	300	
	7 35 »	»	»	»	9,6	34,93	26,98	450	
	6 20 p. m.	8° 55′ N Lat.	»	26,1	27,0	36,00	23,50	0	
	6 15 »	24° 15′ W Long.	»	»	26,2	36,03	23,77	13	
	6 00 »	»	»	»	22,2	35,75	24,75	42	
	5 45 »	»	»	»	9,2	34,96	27,08	530	
		No. 4							
20/6 1913	6 30 p. m.	6° 14′ N Lat.	SE 2	25,9	27,7	34,56	22,12	0	S 30° E 20 miles
	6 20 »	23° 21′ W Long.	»	26,0	27,0	36,00	23,50	40	
	6 07 »	»	»	26.1	16,8	35,62	26,06	90	
	5 55 »	»	»	»	13,5	35,26	26,50	150	
	5 40 »	»	»	»	12,7	35,17	26,61	240	
			Group II.						
	h m	No. 5							
1/7 1913	1 25 p. m.	6° 44′ S Lat.	SE 5	26,7	27.1	35,82	23,32	0	S 60° W 16 miles
	1 15 »	28° 12′ W Long.	»	»	27,0	35,84	23,36	45	
	1 00 »	»	»	»	23,1	36,18	24,82	100	
		No. 6							
3/7 1913	2 00 p. m.	8° 37′ S Lat.	SSE 4	25,9	26,8	36,23	23,72	0	S 36° W 9 miles
	1 55 »	30° 23′ W Long.	»	»	26,5	36,43	23,97	50	
	1 45 »	»	»	»	24,5	36,89	24,95	90	
	1 35 »	»	»	»	23,5	36,87	25,22	120	
	1 15 »	»	»	»	15,3	35,59	26,37	200	
		No. 7							
5/7 1913	1 45 p. m.	10° 11′ S Lat.	SSE 4	25,7	26,5	36,27	23,85	0	S 10 miles
	1 38 »	32° 21′ W Long.	»	»	26,5	36,29	23,87	50	
	1 28 »	»	»	»	24,3	36,80	24,93	100	
	1 16 »	»	»	»	17,2	35,77	26,08	200	
	1 00 »	»	»	»	12,8	35,25	26,64	400	
		No. 8							
7/7 1913	2 55 p. m.	12° 18′ S Lat.	ESE 4	25,7	26,2	36,75	24,31	0	S 63° W 14,2 miles
	2 45 »	34° 38′ W Long.	»	»	26,1	36,80	24,38	20	
	2 35 »	»	»	»	26,1	36,83	24,41	30	
	2 25 »	»	»	»	26,1	36,94	24,49	50	
	2 15 »	»	»	»	24,8	37,03	24,65	100	
	2 05 »	»	»	»	21,1	36,65	25,74	165	

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
				Group II (continued).					
	h m	No. 9							
5/7 1913	1 50 p. m.	14° 39′ S Lat.	ESE 5	25,1	25,9	36,92	24,54	0	S 68° W 14,6 miles
	1 40 »	36° 18′ W Long.	»	»	26,0	36,90	24,49	15	
	» »	»	»	»	26,0	36,56	24,24	40	
	» »	»	»	»	26,0	36,91	24,49	70	
	1 00 »	»	»	»	24,3	36,51	24,71	120	
		No. 10							
6/7 1913	2 00 p. m.	17° 02′ S Lat.	SE 4	24,3	25,1	36,91	24,77	0	W 12 miles
	1 55 »	37° 42′ W Long.	»	»	25,1	36,87	24,74	20	
	» »	»	»	»	25,1	36,95	24,81	40	
	» »	»	»	»	25,1	36,92	24,78	60	
	» »	»	»	»	20,5	36,33	25,66	130	
	1 00 »	»	»	»	18,8	36,13	25,96	200	
		No. 11							
7/7 1913	1 30 p. m.	18° 00′ S Lat.	ESE 3	24,7	24,8	36,98	24,92	0	S 63° W 24,7 miles
	1 25 »	38° 10′ W Long.	»	»	24,9	37,07	24,95	10	
	1 15 »	»	»	»	25,0	37,14	24,98	26	
	1 10 »	»	»	»	25,0	37,14	24,98	54 { The water bottle at bottom on Abrolhosbank	
		No. 12							
8/7 1913	1 00 p. m.	20° 22′ S Lat.	variable	23,5	23,8	36,91	25,16	0	S 45° W 11,5 miles
	» »	38° 55′ W Long.	»	»	23,8	36,91	25,16	10	
	» »	»	»	»	23,8	36,92	25,17	30	
	» »	»	»	»	23,7	36,92	25,20	33	
	» »	»	»	»	23,6	36,85	25,19	65	
	» »	»	»	»	15,6	35,58	26,30	235	
	» »	»	»	»	11,4	35,01	26,73	450	
		No. 13							
9/7 1913	1 35 p. m.	22° 25′ S Lat.	N 3	24,1	23,6	36,82	25,15	0	S 12° W 19,5 miles
	1 30 »	39° 25′ W Long.	»	»	23,6	36,84	25,18	20	
	1 20 »	»	»	»	23,5	36,83	25,19	30	
	1 10 »	»	»	»	23,5	36,82	25,18	56	
	1 00 »	»	»	»	23,2	36,84	25,30	95	
	» »	»	»	»	15,7	35,59	26,29	265	
11/7 1913	1 35 p. m.	26° 15′ S Lat.	N 6	22,9	23,0	36,71	—	0	S 39° W 12,9 miles
	1 28 »	42° 03′ W Long.	»	»	23,0	—	—	30 { are not titrated	
	1 18 »	»	»	»	22,8	—	—	60	
				Group III.					
	h m	No. 14							
13/7 1913	1 00 p. m.	28° 33′ S Lat.	WNW 8	19,4	20,9	36,49	25,68	0	S 58° W 9,5 miles
	» »	43° 30′ W Long.	»	»	20,9	36,40	25,61	25	
	» »	»	»	»	21,1	36,38	25,54	60	
	» »	»	»	»	18,6	35,98	25,89	115	
	» »	»	»	»	15,8	35,47	26,17	200	
	» »	»	»	19,2	14,0	35,52	26,60	320	
		No. 15							
14/7 1913	1 50 p. m.	30° 45′ S Lat.	WNW 4	19,5	19,2	36,12	25,86	0	S 10 miles
	1 25 »	42° 24′ W Long.	»	»	19,2	36,13	25,87	10	
	» »	»	»	»	19,1	36,05	25,81	35	
	» »	»	»	»	18,9	36,06	25,88	65	
	» »	»	»	»	15,8	35,73	26,37	130	
	0 50 »	»	»	»	14,4	35,16	26,48	205	
	» »	»	»	»	13,5	35,46	26,66	350	
15/7 1913		32° 22′ S Lat. 44° 46′ W Long	NW 4	18,5	18,5	—	—	—	S 18° E 32,6 miles

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
			Group III (continued).						
	h m	No. 16							
16/7 1913	2 50 p. m.	32° 56′ S Lat.	NNE 1	15,5	16,6	35,81	26,25	0	S 23° E 7,6 miles
	2 35 »	45° 46′ W Long.	»	»	16,5	35,83	26,29	40	
	2 30 »	»	»	»	16,5	35,87	26,32	70	
	2 20 »	»	»	»	15,3	35,68	26,44	140	
	2 10 »	»	»	»	13,6	35,28	26,50	260	
	2 00 »	»	»	»	11,6	35,03	26,71	400	
	1 45 »	»	»	15,7	8,2	34,61	26,97	500	
	1 20 »	»	»	»	7,9	34,56	26,96	520	
17/7 1913	8 00 a. m.	33° 08′ S Lat. 47° 09′ W Long.	ENE 7	17,3	17,4	35,90	26,12	0	S 38° W 1,3 miles
	1 00 p. m.	33° 35′ S Lat. 47° 24′ W Long.	NE 4	19,0	18,5	36,15	—	0	
	5 30 »	33° 43′ S Lat. 47° 56′ W Long.	N 2	18,1	17,4	35,95	—	0	
		No. 17							
18/7 1913	8 00 a. m.	34° 13′ S Lat. 48° 43′ W Long.	NNW 3	17,8	17,7	35,84	26,00	0	
		No. 18							
18/7 1913	2 00 p. m.	34° 27′ S Lat.	NNW 5	16,9	17,0	35,71	26,08	0	S 50° E 15,5 miles
	1 55 »	49° 24′ W Long.	»	»	17,1	35,76	26,09	15	
	1 50 »	»	»	»	17,3	35,99	26,22	35	
	1 45 »	»	»		17,0	35,98	26,29	62	
	1 30 »	»	»	»	16,6	35,95	26,36	115	
	1 20 »	»	»	»	14,5	35,52	26,49	200	
18/7 1913	5 00 p. m.	34° 36′ S Lat. 49° 53′ W Long.	NNW 4	18,5	18,6	36,00	—	0	
19/7 1913	8 00 a. m.	34° 50′ S Lat. 50° 25′ W Long.	SSW 4	16,9	18,3	36,03	—	0	N 29° W 8 miles
		No. 19							
19/7 1913	1 00 p. m.	34° 55′ S Lat.	SE 1	17,7	18,6	36,19	26,05	0	N 29° W 8 miles
	» »	50° 25′ W Long.	»	»	18,6	36,09	25,98	25	
	» »	»	»	»	18,7	36,11	25,97	52	
	» »	»	»	»	18,6	36,09	25,98	115	
	» »	»	»	»	17,3	35,82	26,09	170	
	» »	»	»	»	15,0	35,55	26,41	290	
	1 55 »	»	»	18,0	11,4	34,99	26,71	450	
19/7 1913	5 00 p. m.	34° 59′ S Lat. 50° 30′ W Long.	SE 2	16,7	18,4	36,12	—	0	
		No. 20							
20/7 1913	2 30 p. m.	35° 13′ S Lat.	SSW 4	13,6	19,0	36,08	25,86	0	W 2,5 miles
	» »	51° 27′ W Long.	»	»	19,0	36,07	25,86	17	
	» »	»	»	»	19,0	36,02	25,82	28	
	» »	»	»	»	18,9	36,11	25,92	60	
	» »	»	»	»	17,9	35,93	26,03	130	
	2 00 »	»	»	»	14,6	35,37	26,36	300	
20/7 1913	6 00 p. m.	35° 12′ S Lat. 51° 35′ W Long.	E 1	13,0	18,2	35,55	—	0	
21/7 1913	8 00 a. m.	36° 00′ S Lat. 53° 25′ W Long.	NE 4	12,4	9 8	33,73	—	0	
		No. 21							
21/7 1913	9 30 a. m.	36° 03′ S Lat.	NE 4	12,3	9,8	33,75	26,03	0 } the water	
	» »	53° 32′ W Long.	»	»	7,9	34,49	26,90	250 } greenish the first observed Albatros	

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
			Group III (continued)						
	h m								
21/7 1913	0 00 p. m.	36° 11′ S Lat. 53° 40′ W Long.	NE 5	12,5	11,0	34,20	—	0 the first sea-weed	
	5 30 »	36° 26′ S Lat. 53° 44′ W Long.	NE 9	12,1	9,1	33,85	—	0	
22/7 1913	8 00 a. m.	37° 50′ S Lat. 54° 28′ W Long.	W 5	10,3	8,1	33,75	—	0	
		No. 22							
22/7 1913	1 45 p. m.	37° 58′ S Lat.	W 6	13,3	14,4	35,27	26,34	0	S 25° E 12 miles
	1 30 »	54° 36′ W Long.	»	»	9,3	34,61	26,79	190	
	1 15 »	»	»	»	6,9	34,34	26,93	350	
		No. 23							
23/7 1913	8 00 a. m.	39° 00′ S Lat. 55° 00′ W Long.	WNW 6	7,3	5,6	33,95	26,79	0	
23/7 1913	4 00 p. m.	39° 10′ S Lat. 55° 04′ W Long.	NW 2	6,5	5,6	33,95	—	0	S 45° E 5,8 miles
24/7 1913	8 00 a. m.	39° 43′ S Lat. 55° 17′ W Long.	NW 3	5,2	4,6	34,15	—	0	
		No. 24							
24/7 1913	1 30 p. m.	39° 56′ S Lat. 55° 35′ W Long.	NW 6	5,5	5,9	33,95	26,75	0	
		No. 25							
25/7 1913	1 45 p. m.	40° 53′ S Lat.	W 2	11,3	6,3	34,11	26,83	0	N 63° E 18 miles
	» »	55° 02′ W Long.	»	»	6,4	34,13	26,83	10	
	» »	»	»	»	6,3	34,14	26,85	35	
	» »	»	»	»	6,1	34,13	26,87	50	
	» »	»	»	»	5,6	34,14	26,95	125	
	1 08 »	»	»	»	5,6	34,16	26,96	300	
		No. 26							
26/7 1913	1 05 p. m.	44° 30′ S Lat.	W 1	9,3	6,7	33,66	26,42	0	S 14° E 6,2 miles
	1 00 »	61° 17′ W Long.	»	»	6,8	33,67	26,42	22	
	0 55 »	»	»	»	6,9	33,68	26,41	60	
	0 45 »	»	»	»	7,0	33,73	26,43	110 the waterbottle at bottom	
30/7 1913	2 00 p. m.	48° 27′ S Lat. 63° 25′ W Long.	SW 3	5,5	6,4	33,75	—	0	S 5° W 34 miles
31/7 —	1 00 »	49° 44′ S Lat. 64° 30′ W Long.	WNW 8	6,5	6,0	33,44	—	0	S 22° W 9 miles
1/8 —	0 00 »	52° 55′ S Lat. 65° 29′ W Long.	SE 10	1,1	4,7	33,55	—	0	
1/8 —	2 00 »	54° 26′ S Lat. 63° 22′ W Long.	WSW 1	3,1	5,3	33,71	—	0	
1/8 —	8 00 a. m.	55° 48′ S Lat. 63° 50′ W Long.	NE 6	0,9	+ 0,9	33,97	—	0 in sights of Staten island	
1/8 —	1 00 p. m.	56° 30′ S Lat. 64° 14′ W Long.	ENE 8	2,9	+ 3,7	34,18	—	0	
2/8	2 00	58° 36′ S Lat. 68° 21′ W Long.	NE 4	3,3	3,8	34,24	—	0	
2/8 —	6 00	58° 50′ S Lat. 70° 20′ W Long.	E 3	2,0	4,1	34,22	—	0	
3/8	1 00	58° 16′ S Lat. 71° 35′ W Long.	WSW 7	1,9	4,0	34,22	—	0	
3/8	2 00	58° 33′ S Lat. 75° 16′ W Long.	NNW 9	3,9	4,2	34,22		0	
3/8	2 00	57° 41′ S Lat. 73° 29′ W Long.	WNW 3	3,9	4,1	34,23		0	

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
	h m								
6/9 1913	2 0 p. m.	57° 08′ S Lat. 75° 45′ W Long.	NNE 1	3,1	4,1	34,20	—	0	
10/9 »	1 0 »	52° 10′ S Lat. 83° 30′ W Long.	SSW 6	3,5	4,8	34,14	—	0	N 45° W 13 miles
11/9 »	2 0 »	49° 25′ S Lat. 83° 17′ W Long.	SSE 5	4,1	5,8	34,18	—	0	N 18° W 6,3 miles
12/9 »	2 0 »	45° 28′ S Lat. 82° 00′ W Long.	NNW 5	6,5	7,2	33,78	—	0	N 34° E 12 miles
14/9 »	2 0 »	44° 48′ S Lat. 80° 42′ W Long.	NNW 7	8,9	8,3	33,85	—	0	
16/9 »	2 0 »	42° 41′ S Lat. 79° 15′ W Long.	WNW 5	10,7	9,9	33,87	—	0	N 61° E 10,3 miles
17/9 »	2 0 »	39° 55′ S Lat. 79° 30′ W Long.	WNW 5	10,7	10,8	33,99	—	0	
18/9 »	1 0 »	37° 35′ S Lat. 78° 20′ W Long.	NW 4	12,7	12,2	34,05	—	0	
19/9 »	2 0 »	35° 22′ S Lat. 77° 35′ W Long.	NW 2	14,3	13,7	34,05	—	0	N 31° E 11,7 miles
20/9 »	2 0 »	32° 32′ S Lat. 77° 33′ W Long.	WSW 3	14,7	14,5	34,34	—	0	N 14° W 16,5 miles
21/9 »	2 0 »	30° 22′ S Lat. 77° 30′ W Long.	S 3	15,9	15,2	34,45	—	0	N 10 miles
22/9 »	2 0 »	27° 22′ S Lat. 77° 36′ W Long.	SSE 5	15,3	15,2	34,44	—	0	N 28° W 21,5 miles
23/9 »	2 0 »	24° 45′ S Lat. 77° 52′ W Long.	SSE 5	16,1	16,6	34,85	—	0	N 50° W 17,8 miles
24/9 »	2 0 »	21° 20′ S Lat. 77° 58′ W Long.	SE 6	16,9	16,9	35,07	—	0	N 55° W 13,5 miles
25/9 »	2 0 »	17° 57′ S Lat. 77° 58′ W Long.	SE 4	17,8	17,2	35,26	—	0	N 14° W 8,2 miles
26/9 »	2 0 »	14° 52′ S Lat. 77° 42′ W Long.	ESE 2	19,5	18,0	35,22	—	0	N 6 miles
26/9 »	5 0 »	14° 42′ S Lat. 77° 40′ W Long.	ESE 2	ca. 18	17,5	35,17	—	0 the water greenish	
26/9 »	9 0 »	14° 30′ S Lat. 77° 38′ W Long.	SE 2	18,1	18,2	35,38	—	0 the water white as milk	
27/9 »	8 0 a. m.	13° 40′ S Lat. 77° 30′ W Long.	SE 3	18,1	18,3	35,30	—	0	N 5° E 12 miles
27/9 »	4 0 p. m.	12° 48′ S Lat. 77° 25′ W Long.	ESE 2	17,9	17,8	35,21	—	0 the water greenish later on reddish	
8/12 »	2 0 »	13° 40′ S Lat. 76° 45′ W Long.	SSE 1	19,5	17,8	35,03	—	0	N 2 miles
9/12 »	1 0 »	14° 35′ S Lat. 76° 07′ W Long.	SSE 2	19,9	18,0	35,03	—	0	N 45° E 4 miles
9/12 »	2 0 »	14° 38′ S Lat. 76° 06′ W Long.	S 2	20,3	18,0	35,19	—	0 the water spots with reddish	
10/12 »	2 0 »	15° 28′ S Lat. 75° 24′ W Long.	SSE 2	18,9	17,6	35,06	—	0	S 18° E 6,3 miles
11/12 »	2 0 »	16° 12′ S Lat. 74° 13′ W Long.	SSE 2	20,3	19,1	35,08	—	0	N 27° W 2,3 miles
12/12 »	2 0 »	16° 55′ S Lat. 72° 48′ W Long.	SE 2	22,9	20,7	35,08	—	0	N 71° W 3,1 miles
13/12 »	8 0 a. m.	— —	SSE 1	20,5	16,1	34,90	—	0 Mollendo ½ mile from the coast	
15/12 »	2 0 p. m.	17° 01′ S Lat. 72° 02′ W Long.	SSE 1	22,3	18,4	34,96	—	0 Mollendo	
15/12 »	8 0 a. m.	17° 48′ S Lat. 71° 38′ W Long.	SE 3	21,1	21,1	35,23	—	0	

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
	h m								
15/12 1913	2 0 p. m.	18° 02′ S Lat. 71° 38′ W Long.	SE 1	23,9	20,6	35,11	—	0	S 57° W 9 miles
16/12 »	8 0 a. m.	19° 02′ S Lat. 71° 03′ W Long	SSE 1	21,5	22,6	35,28	—	0	
16/12 »	2 0 p. m.	19° 22′ S Lat. 70° 52′ W Long.	SSE 2	22,3	23,1	35,44	—	0	N 42° W 1,5 miles
16/12 »	6 0 »	19° 35′ S Lat. 70° 43′ W Long.	SSE 1	21,5	22,7	35,32	—	0	
17/12 »	6 0 a. m.	20° 13′ S Lat. 70° 18′ W Long.	S 1	18,9	18,3	34,92	—	0	
17/12 »	2 0 p. m.	20° 29′ S Lat. 70° 26′ W Long.	SSW 3	21,5	19,8	35,10	—	0	N 4 miles
18/12 »	8 0 a. m.	21° 15′ S Lat. 70° 27′ W Long.	S 1	19,9	19,9	35,10	—	0	
18/12 »	2 0 p. m.	21° 40′ S Lat. 70° 22′ W Long.	S 3	19,9	19,3	34,97	—	0	S 6 miles
19/12 »	8 0 a. m.	22° 05′ S Lat. 70° 15′ W Long.	SSW 2	17,7	16,0	34,87	—	0 ca. 1 mile from the coast	
20/12 »	8 0 »	22° 05′ S Lat. 70° 14′ W Long.	SW 1	19,5	15,9	34,90	—	0 in Tocopilla	

Group IV.

	h m	No. 27 a.							
22/1 1914	8 00 a. m.	22° 05′ S Lat.	calm	20,1	16,4	34,90	25,60	0	
		70° 14′ W Long.	»	»	15,1	34,90	25,90	26 ca. 1 miles from the coast	
		»	»	»	13,9	34,96	26,19	55	
		No. 27 b.							
23/1 1914	1 00 p. m.	22° 04′ S Lat.	SSW 2	21,9	22,1	35,05	24,24	0	
		70° 30′ W Long.	»	»	13,9	34,87	26,12	65 ca. 10 miles from the coast	
		»	»	»	13,4	34,92	26,27	120	
		»	»	»	12,4	34,92	26,47	290	
24/1 1914	2 00 p. m.	21° 50′ S Lat. 71° 06′ W Long.	—	22,8	23,7	—	—	0	N 66° W 5 miles
		No. 28.							
25/1 1914	2 00 p. m.	21° 51′ S Lat. 73° 26′ W Long.	SSE 6	21,7	22,5	35,64	24,58	0	N 19° E 3 miles
26/1 1914	8 00 a. m	22° 45′ S Lat. 76° 04′ W Long.	SSE 5	21,7	21,1	35,48	—	0	N 6° E 16,1 miles
		No. 29.							
27/1 1914	8 00 a. m.	23° 15′ S Lat. 78 04′ W Long.	SSE 2	19,7	20,8	35,30	24,79	0	N 87° W 24 miles
		No. 30.							
28/1 1914	1 45 p. m.	24° 12′ S Lat.	SE 2	20,5	21,1	35,05	24,52	0	N 69° W 16,5 miles
	» »	79° 59′ W Long.	»	»	20,4	34,96	24,64	25	
	» »	»	»	»	17,0	34,63	25,25	35	
				»	15,0	34,60	25,68	110	
		»	»	»	10,5	34,47	26,47	260	
	1 00 »	»	»	»	9,0	34,52	26,76	350	
		No. 31.							
— 1914	8 00 a. m	25° 28′ S Lat. 81° 11′ W Long.	SE 6 »	18,7	20,7	34,94	24,55	0	S 32° W 14 miles
— 1914	8 00 a. m.	27° 16′ S Lat. 83 08′ W Long.	SSE 6	20,9	20,9	—	—	0	N 66° W 12,5 miles

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
			Group IV (continued).						
	h m	No. 32							
1/2 1914	8 00 a. m.	31° 20′ S Lat. 88° 00′ W Long.	SSE 5	20,9	20,5	34,72	24,43	0	S 60° W 10 miles
		No. 33							
3/2 1914	1 50 p. m.	34° 40′ S Lat.	SE 1	21,6	21,4	34,79	24,25	0	S 63° W 11 miles
	1 45 »	92° 11′ W Long.	»	»	20,7	34,81	24,45	15	
	1 40 »	»	»	»	18,5	34,79	25,01	40	
	1 35 »	»	»	»	15,8	34,49	25,41	85	
	» »	»	»	»	13,8	34,34	25,74	145	
	» »	»	»	»	9,8	34,25	26,42	290	
	0 55 p. m.	»	»	»	7,5	34,34	26,88	475	
		No. 34							
4/2 1914	2 00 p m.	35° 08′ S Lat.	calm	22,3	21,2	34,65	24,19	0 the surface temperature changing	S 60° W 14 miles
	» »	92° 26′ W Long.	»	»	20,5	34,67	24,39	20	
	» »	»	»	»	16,3	34,49	25,30	50	
	» »	»	»	»	15,0	34,38	25,52	90	
	» »	»	»	»	12,5	34,29	25,96	180	
	» »	»	»	»	7,5	—	—	400 the bottle broken	
	1 00 p. m.	»	»	»	6,4	34,36	27,02	550	
5/2 1914	8 00 a. m.	35° 22′ S Lat. 92° 10′ W Long.	NW 1	20,1	20,0	34,23	—	0	N 17° E 2 miles
		No. 35							
6/2 1914	8 00 a. m.	36° 50′ S Lat. 90° 56′ W Long.	NNW 3	19,9	19,1	34,09	24,32	0	S 85° E 11,2 miles
7/2 1914	8 00 a. m.	37° 28′ S Lat. 87° 20′ W Long.	NW 4	19,7	19,3	34,20	—	0	S 84° E 18,5 miles
8/2 »	» »	37° 19′ S Lat. 84° 00′ W Long.	NW 3	19,1	19,0	34,20	—	0	N 60° E 14 miles
9/2 »	» »	37° 10′ S Lat. 80° 30′ W Long.	NW 3	19,4	19,4	34,11	—	0	N 57° E 20 miles
11/2 »	» »	35° 00′ S Lat. 74° 46′ W Long.	SSE 5	16,3	15,1	34,38	—	0 at 4 a.m. the temperature of the water was 18,0°	N 24° E 19,6 miles
11/2 »	1 00 p. m.	34° 36′ S Lat. 74° 12′ W Long.	SSE 8	16,7	17,1	34,42	—	0	N 24° E 20 miles
12/2 »	8 00 a. m.	34° 12′ S Lat. 72° 28′ W Long.	SSE 9	15,1	14,9	34,40	—	0	S 40° W 8 miles
8/4 »	4 00 p. m.	33° 01′ S Lat. 71° 38′ W Long.	WNW 3	19,7	15,4	34,36	—	0 close upon Angelos point. Valparaiso	
9/4 »	2 00 »	32° 35′ S Lat. 74° 28′ W Long.	SW 6	15,1	16,8	34,39	—	0	
10/4 »	» »	32° 45′ S Lat. 78° 00′ W Long.	S 5	15,9	17,4	34,27	—	0	
11/4 »	8 00 a. m.	33° 15′ S Lat. 81° 10′ W Long.	S 4	16,3	18,8	34,54	—	0	N 73° W 10,4 miles
12/4 »	» »	33° 17′ S Lat. 84° 02′ W Long.	S 6	16,5	19,6	34,90	—	0	N 79° W 16,3 miles
13/4 »	» »	34° 10′ S Lat. 87° 00′ W Long.	SSE 4	16,7	19,5	34,57	—	0	S 63° W 7 miles
14/4 »	» »	34° 12′ S Lat. 89° 43′ W Long.	SSW 2	18,1	19,6	34,52	—	0	N 85° W 13,3 miles
15/4 »	» »	34° 12′ S Lat. 90° 25′ W Long.	SSW 1	19,4	20,4	34,62	—	0	N 7 miles
18/4 »	» »	34° 06′ S Lat. 90° 58′ W Long.	calm	19,0	20,4	34,69	24,43	0	

Date	Time	Stations	Wind	Temperature atmosph.	Temperature water	Salinity ‰	σ_t	Depht and remarks	Surface current in 24 hours
				Group V.					
	h m	No. 36							
16/4 1914	1 45 p. m.	34° 06′ S Lat.	calm	20,6	20,3	34,70	24,47	1	N 49° W 11 miles
	1 37 »	90° 58′ W Long.	»	»	20,6	34,76	24,43	25	
	1 30 »	»	»	»	20,5	34,75	24,46	50	
	1 22 »	»	»	»	15,6	34,42	25,41	90	
	4 25 »	»	»	20,3	15,4	34,44	25,46	100	
	4 35 »	»	»	»	13,8	34,41	25,78	200	
	1 10 »	»	»	20,6	10,2	34,25	26,35	300	
	1 00 »	»	»	»	7,7	34,33	26,82	500	
		No. 37							
17/4 1914	10 30 a. m.	34° 35′ S Lat.	NNW 1	19,3	20,3	34,45	24,28	0	S 20° E 4,5 miles
	» »	91° 10′ W Long.	»	»	20,3	34,45	24,28	8	
	» »	»	»	»	20,3	34,58	24,38	50	in 16 m depht Temp. 20,5
	» »	»	»	»	15,5	34,40	25,42	95	
	» »	»	»	»	13,0	34,29	25,86	175	
	» »	»	»	»	9,1	34,26	26,54	350	
	» »	»	»	»	7,0	34,29	26,88	500	
	8 30 a. m.	»	»	18,9	7,0	34,34	26,93	520	
18/4 1914	8 00 a. m.	35° 55′ S Lat. 91° 40′ W Long.	NNW 2	19,6	20,0	34,00	—	0	S 32° E 14 miles
19/4 »	» »	38° 10′ S Lat. 91° 58′ W Long.	NW 5	17,0	17,9	34,03	—	0	S 35° E 24,4 miles
20/4 »	» »	38° 20′ S Lat. 91° 00′ W Long.	S 6	12,8	17,0	34,05	—	0	S 14° E 6 miles
21/4 »	» »	38° 20′ S Lat. 89° 30′ W Long.	S 6	12,7	16,1	34,10	—	0	N 30° E 17,3 miles
22/4 »	» »	38° 35′ S Lat. 91° 10′ W Long.	SE 1	12,6	16,9	34,01	—	0	
		No. 38							
22/4 1914	2 00 p. m.	38° 40′ S Lat.	SSE 1	13,7	17,3	34,05	—	0	N 57° W 5,6 miles
	» »	91° 03′ W Long.	»	»	17,3	34,05	—	12	high swell
	» »	»	»	»	17,3	34,08	—	45	
	» »	»	»	»	11,9	33,91	—	110	
23/4 1914	8 00 a. m.	39° 14′ S Lat. 91° 21′ W Long.	ESE 2	13,4	16,1	34,11	—	0	
24/4 »	» »	42° 43′ S Lat. 91° 50′ W Long.	ENE 5	12,8	13,6	33,93	—	0	
25/4 »	» »	45° 05′ S Lat. 91° 42′ W Long.	NNW 2	11,2	11,2	33,91	—	0	
26/4 »	» »	47° 07′ S Lat. 90° 42′ W Long.	SW 4	8,3	9,0	34,09	—	0	
27/4 »	» »	48° 35′ S Lat. 88° 13′ W Long.	SW 4	7,9	8,9	34,81	—	0	N 42° E 7 miles
28/4 »	» »	51° 14′ S Lat. 86° 50′ W Long.	WSW 8	7,6	7,6	34,27	—	0	N 53° E 25 miles
29/4 »	» »	52° 54′ S Lat. 84° 02′ W Long.	NW 3	7,2	7,2	34,25	—	0	N 50° E 25 miles
30/4 »	» »	54° 55′ S Lat. 81° 00′ W Long.	W 6	6,4	5,8	34,29	—	0	S 29° E 15 miles
1/5 »	» »	56° 20′ S Lat. 76° 57′ W Long.	WNW 5	6,9	6,0	34,27	—	0	

Table 5.

Date	Place at apparent noon	Wind	Temperature		Current in 24 hours	Remarks
			atmosph.	water		
4/5	56° 39′ S Lat. 64° 47′ W Long.	W 3	5,6	4,7	—	From noon 30/4 to noon 5/5 the current was running 65 miles towards N 85° E.
5/5	57° 14′ » » 61° 12′ » »	S 1	5,8	5,1	—	
6/5	56° 26′ » » 59° 36′ » »	N 2	5,9	5,5	—	
7/5	54° 42′ » » 58° 31′ » »	SSW 4	3,2	6,3	N 56° W 7,3 miles	
8/5	53° 41′ » » 57° 08′ » »	SSW 1	4,7	6,1	» 24° E 11 »	
9/5	53° 07′ » » 56° 29′ » »	SSW 2	3,8	6,4	N 6 »	
10/5	52° 20′ » » 55° 45′ » »	SE 2	4,0	6,3	N 18° W 22,1 »	11/5 temperature in surface 8 a. m. 5,8°, 1 p. m. 5,4°, 2 p m. 7,9°, 3 p. m. 11,5° and 6 p. m. 9,4°.
11/5	49° 18′ » » 53° 16′ » »	SE by S 5	4,6	6,9	» 9° » 40,5 »	
12/5	47° 08′ » » 50° 44′ » »	SSW 4	8,1	10,9	» 41° » 22,5 »	
13/5	46° 16′ » » 49° 03′ » »	W by N 2	9,6	12,4	—	From noon 12/5 to noon 14/5 the current was running 32 miles towards S 65° E.
14/5	45° 12′ » » 45° 38′ » »	NW by N 5	11,0	11,6	—	
15/5	43° 47′ » » 42° 15′ » »	NNW 3	11,2	10,5	N 76° E 12,5 miles	
16/5	42° 56′ » » 39° 44′ » »	N 3	10,9	10,2	» 52° » 11 »	
17/5	42° 07′ » » 37° 06′ » »	NNW 4	14,4	13,2	S 67° » 18 »	17/6 temperature in surface 4 a. m. 11°, 8 a. m. 12,5° and 7 p. m. 15,3°.
18/5	40° 22′ » » 34° 37′ » »	NNW 5	14,4	13,5	» 37° » 9 »	
19/5	39° 11′ » » 32° 25′ » »	NNW 6	16,1	16,0	—	From noon 18/5 to noon 20/5 the current was running 48 miles towards N 82° E.
20/5	37° 11′ » » 29° 48′ » »	NW 3	16,6	16,2	—	
21/5	34° 51′ » » 28° 14′ » »	NW 5	17,6	17,6	—	
22/5	32° 02′ » » 26° 53′ » »	SSE 5	14,8	18,8	—	From noon 20/5 to noon 22/5 the current was running 24 miles towards N 40° E.
23/5	28° 40′ » » 26° 05′ » »	ESE 6	18,6	22,0	N 70° W 23,5 miles	
24/5	25° 29′ » » 28° 35′ » »	ESE 5	20,9	23,0	» 61° » 31 »	
25/5	22° 47′ » » 25° 31′ » »	ESE 3	23,0	24,7	» 50° » 22 »	
26/5	22° 02′ » » 25° 55′ » »	NNE 2	24,2	24,5	» 37° » 14 »	
27/5	21° 0′ » » 25° 22′ » »	NW 1	24,5	25,4	» 67° » 5 »	
28/5	20° 15′ » » 25° 11′ » »	SE 1	24,9	26,0	» 59° » 7,5 »	
29/5	19° 20′ » » 25° 17′ » »	calm	24,3	26,2	» 57° » 5,5 »	
30/5	17° 46′ » » 25° 39′ » »	ESE 6	23,5	26,2	» 86° » 15,2 »	
31/5	15° 44′ » » 26° 17′ » »	E 3	24,7	26,0	» 79° » 30,6 »	
1/6	13° 36′ » » 26° 55′ » »	ESE 3	24,9	26,4	» 70° » 32,1 »	
2/6	11° 37′ » » 27° 05′ » »	ESE 2	25,7	26,6	» 45° » 8,5 »	
3/6	9° 26′ » » 27° 33′ » »	E 4	26,6	27,4	» 84° » 9 »	
4/6	6° 58′ » » 27° 44′ » »	ESE 4	26,7	27,5	S 79° » 5,1 »	
5/6	4° 40′ » » 27° 58′ » »	SE 4	26,6	27,2	N 53° » 16,3 »	
6/6	2° 47′ » » 28° 35′ » »	SE 3	26,4	26,8	S 71° » 20,1 »	
7/6	0 23′ » » 29° 19′ » »	E by S 3	26,4	27,2	N 38° » 19,5 »	
8/6	1° 51′ N Lat. 29° 54′ » »	E by S 3	26,3	27,5	» 60° » 28 »	
9/6	3° 24′ » » 30° 21′ » »	E 1	24,6	27,6	» 65° » 29 »	
10/6	5° 28′ » » 30° 28′ » »	SSE 3	26,8	27,7	» 58° » 20 »	
11/6	6° 33′ » » 30° 07′ » »	calm	26,3	27,5	» 24° E 22 »	
12/6	7° 41′ » » 30° 44′ » »	NE 3	26,6	27,2	E 6 »	
13/6	9° 51′ » » 32° 51′ » »	NE 4	25,7	26,1	N 66° W 17,3 »	
14/6	11° 46′ » » 34° 34′ » »	»	24,0	24,8	—	From noon 13/6 to noon 15/6 the current was running 11,4 miles towards S 15° W.
15/6	13° 57′ » » 36° 21′ » »	»	24,2	24,4	—	
16/6	16° 28′ » » 37° 59′ » »	»	23,9	23,8	S 51° W 6,5 »	
17/6	19° 14′ » » 39° 45′ » »	NE 5	23,7	24,0	W 2 »	
18/6	21° 57′ » » 41° 18′ » »	»	23,6	23,7	S 19° E 8,5 »	
19/6	24° 37′ » » 42° 51′ » »	NE 4	22,4	23,2	N 87° W 1,8 »	
20/6	27° 20′ » » 43° 53′ » »	ENE 4	22,1	22,4	» 42° » 4,1 »	From 20/6 to 24/6 in the Sargasso sea the ships log was fouled by a lot of sea weed and they reported currents are not to be relied on.
21/6	29° 56′ » » 44° 19′ » »	E 3	22,3	22,6	W 13 »	
22/6	32° 07′ » » 43° 54′ » »	ESE 2	23,4	22,8	N 9° E 21 »	
23/6	33° 44′ » » 43° 53′ » »	SE by S 4	22,6	22,4	» 71° W 19 »	
24/6	35° 33′ » » 43° 12′ » »	S by W 2	22,6	23,0	N 20 »	

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